

COMMERCIAL SPACE MINING WITHIN THE FRAMEWORK OF
THE OUTER SPACE TREATY: VEXING ISSUE OR SIMPLE
SOLUTION?

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INTRODUCTION

The year is 2080, and the world as we know it is a much different place. The pursuit of rare metals to supply mankind's lavish modern lifestyle has had a tremendous impact on the environment. The effects of climate change and overpopulation have ravaged our environment in the form of air pollution and an increased number of droughts. Moreover, the Earth has largely been stripped of its minerals, and as such, the modern conveniences that come with handheld electronics have largely been eliminated.¹ But if one could go back in time, what could be changed? How could this disaster be mitigated? Well, humanity could start by looking for desirable mineral resources beyond our atmosphere.

Asteroids show tremendous promise for companies looking to gather resources from space.² Asteroids can be generalized into two main categories: metallic and non-metallic.³ Non-metallic, or "C-class," asteroids contain "water, carbon dioxide, ammonia, methane, and other 'volatile' substances," which can be used for rocket fuel or other "life-support[ing] purposes."⁴ However, the real value for companies lies within metallic asteroids, as these types of asteroids are thought to contain many types of precious metals, including platinum, that have specific utility in today's society.⁵ One scientist has even proposed that "[t]he asteroid belt has a billion times more platinum than is found on Earth."⁶ In fact, one singular asteroid in the asteroid belt,

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¹ For example, "[o]ne of the most notable items that uses rare Earth metals" is the modern cellphone. See James McSweeney, *Live Long and Prosper: The Need for a New Multilateral Agreement Governing Asteroid Mining*, 58 U. LOUISVILLE L. REV. 559, 572–73 (2020).

² Samuel Roth, *Developing a Law of Asteroids: Constants, Variables, and Alternatives*, 54 COLUM. J. TRANSNAT'L L. 827, 831–33 (2016).

³ See *id.*

⁴ *Id.* at 832–33.

⁵ *Id.* (explaining that "[p]latinum has a wide range of industrial applications on Earth . . . [including] in nearly all modern electronic devices").

⁶ Steven Sicheloff, *Study: Asteroids Provide Sustainable Resource*, NASA (June 13, 2013), https://www.nasa.gov/mission_pages/asteroids/news/asteroidmining.html [<https://perma.cc/Z3GQ->

named 16 Psyche, is made up almost entirely of rare metals, and the iron alone on the asteroid has an estimated value of \$10,000 quadrillion.⁷

A thriving commercial space sector is necessary for a space mining industry to develop. Companies such as Planetary Resources have already made efforts to collect resources from space, but due to the lack of legal structure surrounding the resources it had sought to obtain, its investments dried up, and the company was ultimately bought out by another with a purpose unrelated to space mining.⁸ Since then, other companies—namely, SpaceX, Relativity Space Inc., and Impulse Space—are pushing to develop the commercial space sector.⁹

However, a remaining hurdle to the development of a prominent commercial space sector is ensuring that companies have an incentive to invest the time and resources necessary to go to outer space. As the law currently stands, private companies are unclear as to their rights over the type and quantity of resources they may gather in space because of ambiguity inherent in the Outer Space Treaty,¹⁰ the foundational legal document of international space law.¹¹ Resolving this ambiguity is of paramount importance not only to the sector's development, but also as a way to mitigate the potential hellscape Earth may become if we are not better able to take care of our environment and manage our resources.¹²

This Note will demonstrate the necessity for altering the current legal framework that governs the collection and extraction of resources from outer space, specifically through amending the Outer Space Treaty. In Part I, this Note will examine the current legal framework of outer space both

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⁷ Rachel Mitchell, *Into the Final Frontier: The Expanse of Space Commercialization*, 83 MO. L. REV. 429, 440-41 (2018). See generally *Asteroids In Depth*, NASA, <https://solarsystem.nasa.gov/asteroids-comets-and-meteors/asteroids/in-depth/> [<https://perma.cc/XHM2-W8KA>] (last updated July 19, 2021).

⁸ Jeff Foust, *Asteroid Mining Company Planetary Resources Acquired by Blockchain Firm*, SPACE.COM (Nov. 2, 2018), <https://www.space.com/42324-asteroid-mining-company-planetary-resources-acquired.html> [<https://perma.cc/M68F-ZTJD>].

⁹ Adam Minter, *The Space Race the World Needs Is Finally Starting*, WASHINGTON POST (July 25, 2022, 3:30 PM), https://www.washingtonpost.com/business/the-space-race-the-world-needs-is-finally-starting/2022/07/25/ee38130e-0c0d-11ed-88e8-c58dc3dbae2_story.html [<https://perma.cc/3KAR-PHL5>].

¹⁰ Jennifer Hackett, *New Law Paves the Way for Asteroid Mining—but Will It Work?*, SCIENTIFIC AMERICAN (Dec. 4, 2015), <https://www.scientificamerican.com/article/new-law-paves-the-way-for-asteroid-mining-but-will-it-work/> [<https://perma.cc/PYY4-NL3P>] (explaining that the Outer Space Treaty is ambiguous about who owns resources that are extracted from outer space); see also *infra* Part I.A.1.

¹¹ See Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter *Outer Space Treaty*].

¹² Julia Rosen, *The Science of Climate Change Explained: Facts, Evidence and Proof*, N.Y. TIMES, <https://www.nytimes.com/article/climate-change-global-warming-faq.html> [<https://perma.cc/9Y2G-45Y3>] (last updated Nov. 6, 2021) (explaining the harmful consequences of climate change on our environment and humanity's way of life if human behavior does not change).

internationally and domestically in the United States. Part II will highlight how some scholars have proposed addressing the ambiguity inherent in the Outer Space Treaty and then analyze the feasibility of their proposed solutions. Part III will discuss the importance of certain provisions within the Outer Space Treaty and analyze why an amendment is the best path forward to fixing the legal structure of outer space as it pertains to resource collection and extraction. Finally, Part VI will propose potential provisions of an amendment to Article II of the Outer Space Treaty based on language used in the U.S. Commercial Space Launch Competitiveness Act.

I. RELEVANT LAW

Outer space law has largely been established through and governed by the United Nations' Committee on the Peaceful Uses of Outer Space (COPUOS).¹³ However, some nations have implemented additional legislation that builds upon the framework set up by the COPUOS treaties.¹⁴ As such, this section will examine both international treaties and domestic laws that regulate outer space and space mining.

A. *International Law*

Outer space law has been addressed on an international level through five treaties: (1) the 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); (2) the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (the Rescue Agreement); (3) the Convention on International Liability for Damage Caused by Space Objects (the Liability Convention); (4) the Convention on Registration of Objects Launched into Outer Space (the Registration Convention); and (5) the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (the Moon Agreement).¹⁵ These five treaties make up the *corpus juris*

¹³*Space Law Treaties and Principles*, UNOOSA, <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html> [https://perma.cc/9WPB-JA2M] (last visited Nov. 7, 2022).

¹⁴See, e.g., Jeff Foust, *Luxembourg adopts space resources law*, SPACE NEWS (July 17, 2017), <https://spacenews.com/luxembourg-adopts-space-resources-law/> [https://perma.cc/GB24-ZYFS] (“The government of Luxembourg has passed a bill giving companies the rights to space resources they extract from asteroids or other celestial bodies.... [The law is] similar in scope to the U.S. law, with the exception that companies need not be based in Luxembourg to take advantage of its provisions. Both the U.S. and Luxembourg laws grant ownership to resources only after they have been extracted, avoiding potential conflicts with the Outer Space Treaty, which prohibits companies from claiming territory on celestial bodies.”).

¹⁵ UNOOSA, *supra* note 13.

spatiallis.¹⁶ While all are important as foundational space law treaties, of particular relevance to this Note are the Outer Space Treaty, the Liability Convention, and the Moon Agreement. Accordingly, each will be discussed in turn.

1. Outer Space Treaty

The Outer Space Treaty is the seminal legal framework governing the rights and responsibilities of all mankind in outer space.¹⁷ Consisting of seventeen articles, the Outer Space Treaty entered into force in 1967.¹⁸ Since its inception, the Treaty has been ratified by well over 100 countries, including the United States and all other space-faring nations.¹⁹ The Treaty, largely modeled after the Antarctic Treaty,²⁰ sought to encourage cooperation among space-faring nations and ensure that space was used solely for peaceful purposes.²¹

Article II is the shortest article in the Treaty,²² yet its significance to the issue at hand is greater than any other. Article II explicitly states that “[o]uter space, including the moon and other celestial bodies, is not subject to *national* appropriation by claim of sovereignty, by means of use or occupation, or by other means.”²³ This article was of particular importance to the drafters of the Treaty given the backdrop of the Cold War and efforts by both the Soviet Union and the United States to land on the moon.²⁴ Article II makes no explicit mention of whether its prohibition on the appropriation of space resources would apply to private companies or individuals.²⁵ Accordingly, the resulting ambiguity has led to various interpretations of whether private appropriation of resources in space is permitted.²⁶ While some countries have interpreted Article II to mean that the non-appropriation principle also applies to private entities,²⁷ the U.S. State

¹⁶ “*Corpus juris spatialis*” is the Latin phrase for “body of space law.” See Lucien Rapp, *Space Lawmaking*, THE SPACE REVIEW (July 2, 2018), <https://www.thespacereview.com/article/3523/1> [<https://perma.cc/9EQQ-UXS7>].

¹⁷ See Outer Space Treaty, *supra* note 11.

¹⁸ *Id.*

¹⁹ 3 L. OF ENVTL. PROT. § 28:7(a)(i) (2024).

²⁰ Daniel M. Arons & Paul G. Dembling, *The Evolution of the Outer Space Treaty*, 33 J. of Air L. & Com. 419, 422–23 (1967) (discussing how the drafters of the Outer Space Treaty modeled its provisions after the Antarctic Treaty and the Nuclear Test Ban Treaty).

²¹ See Outer Space Treaty, *supra* note 11, at art. I, IV.

²² *Id.* at art. II.

²³ *Id.* (emphasis added).

²⁴ Arons & Dembling, *supra* note 20, at 427.

²⁵ See Outer Space Treaty, *supra* note 11, at art. II.

²⁶ See *infra* Part II.

²⁷ Belgium, Brazil, and Russia oppose commercial asteroid mining, believing that it is a violation of the Outer Space Treaty. See Karla Lant, *Ambiguous Laws Could Prevent Us from Taking Full Advantage of Celestial*

Department has consistently interpreted the Outer Space Treaty to permit the private appropriation of outer space resources.²⁸

Article IV of the Outer Space Treaty serves the purpose of reinforcing the signatories' commitment to international peace, explicitly stating that outer space shall be used "exclusively for peaceful purposes."²⁹ Article IV also prohibits the placement of nuclear weapons or weapons of mass destruction on celestial bodies³⁰ or "station[ing] such weapons in outer space in any other manner."³¹

Article VI provides that signatories to the Treaty are responsible for their activities in space, "regardless of whether the activities are carried out by government agencies or non-government entities."³² Article VI further states that the "activities of non-governmental entities in outer space . . . shall require authorization and continuing supervision by the appropriate State Party to the Treaty."³³ In the context of this Article, "appropriate State Party" means that if a signatory to the Outer Space Treaty allows a private entity to launch a person or object into space, that signatory is responsible for any consequences resulting from that launch.³⁴ No matter how practical the commercial space sector becomes, it seems the drafters intended that private action in space be prohibited unless there is some state supervision over that activity.³⁵

Article VII bestows international liability on signatories for all space activities that launch from within their borders if the result of those activities cause damage to another signatory "or its natural or juridical persons . . . or its component parts on the Earth, in air space or in outer space, including the Moon and other celestial bodies."³⁶ Article VI and Article VII are thus incredibly important because they ensure accountability for the actions of mankind in space and limit reckless endeavors by both nations and private entities from causing catastrophic damage to the Earth, celestial bodies, or

Resources, FUTURISM (Aug. 31, 2017), <https://futurism.com/ambiguous-laws-could-prevent-us-from-taking-full-advantage-of-celestial-resources> [<https://perma.cc/G6D4-4EHN>].

²⁸ See Brian J. Egan, *The Next Fifty Years of the Outer Space Treaty*, Address Before the Galloway Symposium on Critical Issues in Space Law (Dec. 7, 2016), *transcribed on*, Archive of the U.S. Dep't of State from Jan. 20, 2009, to Jan. 20, 2017, U.S. DEP'T OF STATE, <https://2009-2017.state.gov/s/1/releases/remarks/264963.htm> [<https://perma.cc/QE8G-FC6J>] (last visited Mar. 7, 2024).

²⁹ Outer Space Treaty, *supra* note 11, at art. IV.

³⁰ Celestial bodies have been defined by the International Astronomical Union to include the sun, planets, moons, near-Earth objects, dwarf planets, trans-Neptunian objects, asteroids, comets, and Kuiper belt objects. See Leslie I. Tennen, *Enterprise Rights and the Legal Regime for Exploitation of Outer Space Resources*, 47 U. PAC. L. REV. 281, 284 (2016).

³¹ Outer Space Treaty, *supra* note 11, at art. IV.

³² *Id.* at art. VI.

³³ *Id.*

³⁴ *Id.*

³⁵ Arons & Dembling, *supra* note 20, at 437.

³⁶ Outer Space Treaty, *supra* note 11, at art. VII.

outer space in general.³⁷

While Articles II, IV, VI, and VII were of primary importance to the drafters, other articles are also worth noting. Article XI provides that all signatories must communicate with “the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of [space] activities.”³⁸ Article XIII essentially provides that any dispute amongst signatories must be resolved through a mediating body.³⁹ That mediating body must be either an international organization, such as the United Nations, or one or more signatories to the Outer Space Treaty.⁴⁰ Article XV provides that “[a]ny State Party to the Treaty may propose amendments to this Treaty,” and the amendments enter into force “upon their acceptance by a majority” of signatories.⁴¹ Finally, Article XVI provides that any signatory may withdraw from the Treaty, with any withdrawal taking effect “one year from the date of receipt of this notification.”⁴²

While fairly extensive, the drafters worked under an environment of immense pressure to reach an international agreement to govern outer space.⁴³ In drafting the agreement, they thus focused solely on “settling essential and urgent issues.”⁴⁴ Accordingly, some issues were left unaddressed, to be handled in subsequent international agreements.

2. Liability Convention

The principles outlined in Article VII—namely, that signatories assume liability for the activities of their governmental and non-governmental entities in space⁴⁵—were of such importance to the international community that they were expanded on in the Liability Convention.⁴⁶ The Liability Convention was ratified by over seventy-five nations⁴⁷ and entered into force in 1972.⁴⁸ The Liability Convention further emphasizes state responsibility for space travel by declaring that if a space object causes damage or death, “[a] launching State shall be *absolutely liable*

³⁷ See generally *id.*; see also *id.* at art. VI.

³⁸ *Id.* at art. XI.

³⁹ *Id.* at art. XIII.

⁴⁰ *Id.*

⁴¹ *Id.* at art. XV.

⁴² *Id.* at art. XVI.

⁴³ Arons & Dembling, *supra* note 20, at 425.

⁴⁴ *Id.* at 428.

⁴⁵ See Outer Space Treaty, *supra* note 11, at art. VII.

⁴⁶ Convention on International Liability for Damage Caused by Space Objects, Nov. 29, 1971, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention].

⁴⁷ Roth, *supra* note 2, at 844–45.

⁴⁸ UNOOSA, *supra* note 13.

to pay compensation for damage caused by its space object on the surface of the [E]arth or to aircraft flight.”⁴⁹

For damage that occurs on the Earth’s surface, the responsible signatory is strictly liable for damage unless the claiming party acted with gross negligence or an intent to cause damage *and* the responsible signatory otherwise complied with international law.⁵⁰ However, if damage occurs anywhere else, the responsible signatory is subject to a negligence standard.⁵¹

While an important legal document for the governance of outer space, the Liability Convention has never been invoked despite instances which, in theory, should have necessitated its application.⁵² Thus, questions and criticism remain.⁵³

3. Moon Agreement

The Moon Agreement, opened for signature in 1979,⁵⁴ was an attempt by some in the international community to “expand and recast the law of space.”⁵⁵ Of particular relevance, the Agreement represented the first attempt by the international community to specifically address the issue of collecting resources from celestial bodies.⁵⁶

The Moon Agreement provides that “[t]he moon and its natural resources are the common heritage of mankind.”⁵⁷ The Agreement also states that “[n]either the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become property of any State . . . or non-governmental entity or of any natural person.”⁵⁸ Further, the agreement urges

⁴⁹ Liability Convention, *supra* note 46, at art. II (emphasis added).

⁵⁰ *See id.* at art. IV.

⁵¹ *Id.* at art. III.

⁵² For example, in 1978, a Russian satellite crashed into a Canadian forest. The satellite contained radioactive materials, and the crash ultimately caused nearly \$14 million in damage. Canada presented a claim to the Soviet Union for those damages based on the Liability Convention. However, the Soviet Union disputed the damage amount because, “according to some interpretations of the Liability Convention, Canada actually incurred no damages” because the satellite crashed into an “uninhabited wilderness.” As a result, Canada only received \$3 million for damages caused by the crash. *See* Van C. Ernest, *Third Party Liability of the Private Space Industry: To Pay What No One Has Paid Before*, 41 CASE W. RES. L. REV. 503, 525–26 (1991); *see also* Sidney Cohen, *Story of Cosmos 954 continues*, N. NEWS SERV. LTD. (July 25, 2018), <https://www.nnsl.com/nwtnewsnorth/story-of-cosmos-954-continues/> [https://perma.cc/7M7M-9K7C].

⁵³ One criticism is founded in the uncertainty of how the Liability Convention would “reconcile a dispute between a common law jurisdiction and a civil law jurisdiction, each with its own conception of ‘fault?’” Roth, *supra* note 2, at 845. Further, the Convention has also been criticized for its lack of “substantive legal content.” *Id.*

⁵⁴ Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S. 3, 18 I.L.M. 1434 [hereinafter Moon Agreement].

⁵⁵ 3 L. OF ENVTL. PROT. § 28:7(a)(ii) (2024).

⁵⁶ Moon Agreement, *supra* note 54, at art. 11.

⁵⁷ *Id.*; Article 1(1) of the Moon Agreement provides that “[t]he provisions of this Agreement relating to the moon shall *also* apply to other celestial bodies within the solar system.” *Id.* at art. 1. (emphasis added).

⁵⁸ *Id.* at art. 11, § 3.

for the establishment of, but does not explicitly create, an international regime to govern the exploitation of natural resources of our Moon and other celestial bodies.⁵⁹

Unfortunately for the drafters and signatories of the Moon Agreement, it has not been widely accepted by the international community.⁶⁰ In fact, it is the position of the United States, as well as other major space-faring nations, that the Moon Agreement does not express “customary international law.”⁶¹ Consequently, despite the prohibition on the collection of natural resources from celestial bodies,⁶² the Moon Agreement does not have much influence on international law and can thus be largely disregarded.

4. Artemis Accords

The most recent international effort to build upon the *corpus juris spatialis* is the Artemis Accords.⁶³ The Artemis Accords were launched by eight nations in October 2020⁶⁴ and have since received signatures from twenty-five other countries.⁶⁵ While generally emphasizing that any space activities must be for purely peaceful purposes and in accordance with international law,⁶⁶ the Artemis Accords also speak specifically to the collection of space resources.⁶⁷

⁵⁹ *Id.* at art. 11, § 5.

⁶⁰ Compare the number of signatories/ratifiers of the Outer Space Treaty (129) to the number of signatories/ratifiers of the Moon Agreement (20). See *Status of International Agreements relating to activities in outer space as at 1 January 2016*, UNOOSA (Apr. 4, 2016), https://www.unoosa.org/res/oosadoc/data/documents/2016/aac_105c_22016crp/aac_105c_22016crp_3_0.html/AC105_C2_2016_CRP03E.pdf [<https://perma.cc/YA6Z-HEPF>].

⁶¹ Exec. Order No. 13,914, 85 Fed. Reg. 20,381, § 2 (Apr. 10, 2020); see also 3 L. OF ENVTL. PROT. § 28:7(a)(ii) (2024) (explaining that the United States’ position “reflects the majority view about the lack of efficacy of the Moon Agreement”). For context, customary international law is a concept that “refers to international obligations . . . result[ing] from a general and consistent practice of states that they follow from a sense of legal obligation.” Legal Information Institute, *customary international law*, CORNELL L. SCH., https://www.law.cornell.edu/wex/customary_international_law [<https://perma.cc/Y4WM-Z6CM>] (last visited Feb. 28, 2023).

⁶² Moon Agreement, *supra* note 54, at art. 11.

⁶³ *The Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes*, NASA, <https://www.nasa.gov/specials/artemis-accords/img/Artemis-Accords-signed-13Oct2020.pdf> [<https://perma.cc/9K7D-9T6R>] [hereinafter Artemis Accords].

⁶⁴ *Id.*

⁶⁵ As of January 2024, the Artemis Accords have been signed by Angola, Argentina, Australia, Bahrain, Brazil, Bulgaria, Canada, Colombia, the Czech Republic, Ecuador, France, Germany, Iceland, India, Israel, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Nigeria, Poland, the Republic of Korea, Romania, Rwanda, Saudi Arabia, Singapore, Spain, Ukraine, the United Arab Emirates, the United Kingdom, and the United States. See *Artemis Accords Signatories*, U.S. DEP’T OF STATE (Jan. 3, 2024), <https://www.state.gov/artemis-accords/> [<https://perma.cc/M6XD-YYPM>].

⁶⁶ Artemis Accords, *supra* note 63, at art. 3; see also Outer Space Treaty, *supra* note 11, at art. III, VI, and VII.

⁶⁷ Artemis Accords, *supra* note 63, at art. 10.

Indeed, the Artemis Accords outline a framework for the collection of space resources.⁶⁸ Ensuing subsections recognize the importance of the utilization of space resources⁶⁹ and emphasize that the extraction and use of those resources should “be executed in a manner that complies with the Outer Space Treaty.”⁷⁰ Further, the Accords address the issue of “national appropriation” in Article II of the Outer Space Treaty: “[t]he Signatories affirm that the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty, and that contracts and other legal instruments relating to space resources should be consistent with that Treaty.”⁷¹ Additionally, the Accords re-emphasize the goal of cooperation outlined in the Outer Space Treaty, that signatories “intend to use their experience under the Accords to contribute to multilateral efforts to further develop international practices and rules applicable to the extraction and utilization of space resources.”⁷²

While the Artemis Accords represent a good step towards developing a friendly legal framework for space resource collection, it falls victim to the same issue the Moon Agreement faced: low international support. While many of the thirty-three nations that have signed on to the Artemis Accords are space-faring nations, the Accords are notably missing China and Russia as signatories.⁷³ Because these countries focus heavily on expansion into outer space, their absence is particularly significant.⁷⁴ Thus, any effort to establish a sound, effective legal framework for the extraction of space resources will likely require the consent of a much larger portion of the international community.

B. Domestic Law

Although the field of space law is largely occupied by international treaties, some countries have recently begun to develop domestic law as it pertains to space mining and resource collection. Notably, the United States and Luxembourg have passed domestic legislation to address ambiguities present in the Outer Space Treaty.⁷⁵ While it is important to note that the

⁶⁸ *Id.*

⁶⁹ *Id.* at art. 10, § 1.

⁷⁰ *Id.* at art. 10, § 2.

⁷¹ *Id.*

⁷² *Id.* at art. 10, § 4.

⁷³ See UNOOSA, *supra* note 60.

⁷⁴ See Bradley Bowman & Jared Thompson, *Russia and China Seek to Tie America's Hands in Space*, FOREIGN POL'Y (Mar. 31, 2021), <https://foreignpolicy.com/2021/03/31/russia-china-space-war-treaty-demilitarization-satellites/> [<https://perma.cc/TF6J-2QRE>] (explaining that both China and Russia are seeking to militarize space and are currently deploying systems capable of destroying satellites, seemingly to level the playing field with the United States).

⁷⁵ U.S. Commercial Space Launch Competitiveness Act of 2015, Pub. L. No. 114-90, 129 Stat. 704

United States is not the only country establishing domestic laws for outer space, this Note's discussion of domestic legislation will focus on America's legislative efforts to develop its own commercial space sector.

1. ASTEROIDS Act

The first notable, albeit failed, attempt by American legislators to address the issue of resource collection in outer space was the American Space Technology for Exploring Resource Opportunities in Deep Space Act (the ASTEROIDS Act).⁷⁶ Introduced on July 10, 2014, by Congressmen Bill Posey (R-FL) and Derek Kilmer (D-WA), the ASTEROIDS Act sought to “promote the development of a commercial asteroid resources industry for outer space in the United States and to increase the exploration and utilization of asteroid resources in outer space.”⁷⁷ Further, the bipartisan Act sought to establish property rights for space resources, stating that “[a]ny resources obtained in outer space from an asteroid are the property of the entity that obtained such resources.”⁷⁸

Ultimately, the ASTEROIDS Act was not passed into law.⁷⁹ However, lobbying efforts by companies that were eager to collect resources from space ultimately led to the aforementioned principles outlined in the ASTEROIDS Act being subsumed into the U.S. Commercial Space Launch Competitiveness Act.⁸⁰

2. U.S. Commercial Space Launch Competitiveness Act

The U.S. Commercial Space Launch Competitiveness Act (the CSLCA), signed into law by President Barack Obama on November 25, 2015, represents the most substantive domestic legislation to address the collection and extraction of space resources to date.⁸¹ The goal of the CSLCA was to “facilitate a pro-growth environment for the developing commercial space industry by encouraging private sector investment and creating more

(2015) [hereinafter CSLCA]; *Legal Framework*, LUX. SPACE AGENCY, <https://space-agency.public.lu/en/agency/legal-framework.html> [<https://perma.cc/GYS5-JSUF>] (last updated Mar. 2, 2022).

⁷⁶ American Space Technology for Exploring Resource Opportunities in Deep Space Act, H.R. 5063, 113th Cong. (2014) [hereinafter ASTEROIDS Act].

⁷⁷ *Id.*

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ See Matthew Shaer, *The Asteroid Miner's Guide to the Galaxy*, FOREIGN POL'Y (Apr. 28, 2016), <https://foreignpolicy.com/2016/04/28/the-asteroid-miners-guide-to-the-galaxy-space-race-mining-asteroids-planetary-research-deep-space-industries/> [<https://perma.cc/AV9J-JGDH>].

⁸¹ CSLCA, *supra* note 75.

stable and predictable regulatory conditions.”⁸²

Title I of the CSLCA, the Spurring Private Aerospace Competitiveness and Entrepreneurship Act (the SPACE Act), coincides with the American legislative effort to bolster the commercial space sector.⁸³ The SPACE Act calls for a reexamination of insurance requirements and costs, expands statutory protections for those engaging in commercial space launch activities, consolidates government oversight of these activities to the director of the Office of Science and Technology Policy, and addresses the use of a combination of government and private entities in outer space.⁸⁴

More pertinent to this Note is Title IV of the CSLCA, the Space Resource Exploration and Utilization Act (the SREU Act), which specifically addresses space resource collection by American citizens in outer space.⁸⁵

The Act defines “asteroid resource” as “a space resource found on or within a single asteroid.”⁸⁶ The Act further defines “space resource” as “an abiotic resource *in situ* in outer space,”⁸⁷ while also expanding the definition to include water and minerals.⁸⁸ The inclusion of “*in situ*”⁸⁹ infers that the statutory language of the SREU Act prevents a commercial entity from extracting an entire asteroid from outer space. This interpretation is important for ensuring continued American compliance with Article II of the Outer Space Treaty.⁹⁰

The SREU Act further authorizes the president, acting through appropriate federal agencies, to:

- (1) facilitate commercial exploration for and commercial recovery of space resources by United States citizens;
- (2) discourage government barriers to the development in the United States of economically viable, safe, and stable industries for commercial exploration for and commercial recovery of space resources in manners consistent with the international obligations of the United States; and
- (3) [to] promote the right of United States citizens to engage in commercial exploration for and commercial recovery of

⁸² *Id.*

⁸³ See generally CSLCA, *supra* note 75, at Title I.

⁸⁴ See generally *id.*; see also Michael Dodge, *The U.S. Commercial Space Launch Competitiveness Act of 2015: Moving U.S. Space Activities Forward*, 29 AIR & SPACE L. 4, 4–5 (2016).

⁸⁵ CSLCA, *supra* note 75, at Title IV.

⁸⁶ *Id.* at Title IV, § 51301(1).

⁸⁷ *Id.* at Title IV, § 51301(2)(A) (emphasis added).

⁸⁸ *Id.* at Title IV, § 51301(2)(B).

⁸⁹ “*In situ*” means “in the natural or original position or place.” *In situ*, MERRIAM-WEBSTER.COM, <https://www.merriam-webster.com/dictionary/in%20situ> [<https://perma.cc/4H8Y-2EFG>] (last visited Nov. 6, 2022).

⁹⁰ See Outer Space Treaty, *supra* note 11, at art. II.

space resources free from harmful interference, in accordance with the international obligations of the United States and subject to authorization and continuing supervision by the Federal Government.⁹¹

These provisions not only bolster the role of the executive branch in supporting and implementing laws to help the commercial space industry, they also reiterate Congress' commitment to ensure that the United States complies with principles outlined in the Outer Space Treaty.⁹²

Finally, the SREU Act establishes property rights over asteroid or space resources for American citizens, providing that:

A United States 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 the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States.*⁹³

The principles outlined in this section are a partial implementation of the space resource property rights proposed by Representatives Posey and Kilmer in the ASTEROIDS Act.⁹⁴ Again, the section places an emphasis on continued compliance with the Outer Space Treaty.⁹⁵ Thus, while the CSLCA is a good step towards creating a sound legal framework for the extraction of space resources, its successful implementation depends on the international community's interpretation of the ambiguities present in Article II of the Outer Space Treaty.

Though the International Institute of Space Law approved the CSLCA in its entirety,⁹⁶ it remains unknown how other unaffiliated countries

⁹¹ CSLCA, *supra* note 75, at Title IV, § 51302(a)(1)-(3).

⁹² *Id.* at Title IV, § 51302(a)(3) (“The President . . . shall . . . promote the right of United States citizens to engage in commercial exploration for and commercial recovery of space resources . . . *in accordance with the international obligations of the United States . . .*”) (emphasis added).

⁹³ *Id.* (emphasis added).

⁹⁴ See ASTEROIDS Act, *supra* note 76.

⁹⁵ CSLCA, *supra* note 75, Title IV, § 51303 (“A United States citizen engaged in commercial recovery of an asteroid resource or a space resource . . . shall be entitled [to that resource] . . . in accordance with applicable law, *including the international obligations of the United States*”) (emphasis added).

⁹⁶ Marcia Smith, *International Institute of Space Law OK with U.S. Asteroid Mining Law*, SPACEPOLICYONLINE.COM, <https://spacepolicyonline.com/news/international-institute-of-space-law-ok-with-u-s-asteroid-mining-law/> [<https://perma.cc/3TPS-3JRG>] (last updated Dec. 24, 2015, 7:05 AM). The International Institute of Space Law is a “global association for space law with individual and institutional members from almost 50 countries.” *About the International Institute of Space Law*, INT’L INST. SPACE L., <https://iisl.space/> [<https://perma.cc/6NJG-97MV>] (last visited Feb. 24, 2023). Its “mission is the promotion of further development

perceive efforts by American entities to harvest resources from outer space. If such domestic legislation with international implications is to be effective, international support is imperative. If there is any doubt as to the legislation's international validity, companies are less likely to invest the time and resources necessary to develop a substantive commercial space sector and harvest resources. Thus, while another step towards the ultimate goal of providing companies a legal right over the space resources they harvest, the international community's uncertain reception of the CSLCA limits its impact on the development of a commercial space sector.

Although the current body of space law provides a foundation from which a commercial space sector could potentially develop, a significant deficiency still exists: current law does not explicitly address the legal issues that arise within the context of commercial space mining. Accordingly, the contrasting interpretations of the Outer Space Treaty's application to commercial space mining has led to varied solutions.⁹⁷

II. INTERPRETATIONS OF THE OUTER SPACE TREATY

The question remains as to how the United States should interpret the Outer Space Treaty with regard to commercial space mining. The only incidence of the American judiciary interpreting the Outer Space Treaty occurred in *Nemitz v. United States*, where a federal district court concluded that the Outer Space Treaty did not create "any rights . . . to appropriate private property rights on asteroids."⁹⁸ The *Nemitz* ruling, however, occurred before the passage of the CSLCA, so it is unclear how a court might interpret a potential conflict between the language of the Outer Space Treaty and federal legislation.⁹⁹

Outside of the courtroom, however, there have been numerous interpretations of how the Outer Space Treaty affects property rights over space resources, and various solutions to curing the ambiguity in the Treaty have been proposed. An examination of a variety of these interpretations and solutions is, therefore, appropriate.

A. The Outer Space Treaty is an insufficient legal framework to address space mining and, accordingly, the U.S. should withdraw.

of space law and expansion of the rule of law in the exploration and use of outer space for peaceful purposes." *Id.*

⁹⁷ See *infra* Part II.

⁹⁸ *Nemitz v. U.S.*, No. CV-N030599-HDM-RAM, 2004 WL 3167042, at *2 (D. Nev. Apr. 26, 2004).

⁹⁹ The judiciary has a duty to enforce not only American laws, but also to enforce the rules of international treaties that the United States has signed. See U.S. Const. art. III, § 2 ("The judicial power shall extend to . . . the Laws of the United States, and Treaties made . . .") (emphasis added).

While many scholars have concluded that the Outer Space Treaty is an insufficient legal framework to address space mining, one scholar in particular, Drew Fryhoff, has proposed withdrawing from the Outer Space Treaty because of its perceived inability to protect American commercial interests.¹⁰⁰ He supports his approach by specifically focusing his ire on three articles of the Treaty: Article II, Article VI, and Article VII.¹⁰¹

Fryhoff highlights the fact that some countries—specifically, Belgium, Russia, and Brazil—have interpreted the non-appropriation doctrine in Article II of the Treaty to apply to non-governmental entities.¹⁰² Moreover, he argues, like other scholars,¹⁰³ that Article II and Article IV work in tandem to essentially make any appropriation of space resources a national appropriation.¹⁰⁴ Further, Fryhoff notes an issue with Article VII, namely that it “abates a risk of liability for any activities conducted in outer space for American commercial space companies because all liability is automatically shifted to the United States government.”¹⁰⁵ Supposing that these provisions negatively impact the development of an American commercial space industry, Fryhoff proposes that the United States withdraw from the Outer Space Treaty altogether in favor of more congressional action.¹⁰⁶

Upon withdrawing from the Outer Space Treaty, Fryhoff argues that the United States should do three things. First, Congress should “expand on the limited commercial property rights provided by the [CSLCA]” and “adopt legislation that specifically outlines the boundaries of the commercial appropriation of . . . celestial bodies.”¹⁰⁷ Next, the United States should also “secede from the Liability Convention,” and Congress should then “adopt legislation that shifts the burden of liability . . . from the United States government to the American commercial space sector.”¹⁰⁸ Finally, the United States should create a new government office to “regulate the American commercial space industry under one roof.”¹⁰⁹

For various reasons, this proposed withdrawal from the Outer Space Treaty is not a feasible path forward.¹¹⁰ Ultimately, it is in the best interest of the United States, and all space-faring nations, to retain the Outer Space

¹⁰⁰ Drew M. Fryhoff, *The Revolution of the Commercial Space Industry: Why Current Laws Must Be Replaced Before American Business Expands to the Moon and Beyond*, 15 BROOK. J. CORP. FIN & COM. L. 237, 241 (2020).

¹⁰¹ *Id.* at 243.

¹⁰² *Id.* at 243–44; see also Lant, *supra* note 27.

¹⁰³ Tennen, *supra* note 30, at 445.

¹⁰⁴ Fryhoff, *supra* note 100, at 245.

¹⁰⁵ *Id.* at 247–48.

¹⁰⁶ *Id.* at 241.

¹⁰⁷ *Id.* at 254.

¹⁰⁸ *Id.* at 254–55.

¹⁰⁹ *Id.* at 255.

¹¹⁰ See *infra* Part III.A.

Treaty as the foundational legal framework of outer space.

B. If the Outer Space Treaty does not allow for space mining, a new regulatory scheme is necessary.

Other scholars have argued that the Outer Space Treaty, and space law in general, is inadequate to regulate mining and other space activities as a whole.¹¹¹ For example, Rachel Mitchell argues that updating international space law is “urgently needed” to ensure that all nations have a right to peacefully explore and use outer space.¹¹² While there has been some debate over whether Article II’s prohibition on the appropriation of outer space applies to private entities, Mitchell argues that the ambiguity inherent in the Treaty creates a feasible argument that the non-appropriation doctrine applies to private entities.¹¹³ The crux of her argument is that “because Article VI [of the Outer Space Treaty] requires that governments authorize and supervise any private citizens in space, it is arguable that *any* activity performed in space, whether by the government or by a private actor, is considered ‘national’ for purposes of the treaty.”¹¹⁴ As a result, Mitchell proposes that an amendment be made to the Outer Space Treaty using the Law of the Sea or the Antarctic Treaty as models.¹¹⁵

However, in recognizing that some business leaders have argued against an amendment to the Outer Space Treaty,¹¹⁶ Mitchell also proposes a unique alternative solution: crowdsourcing.¹¹⁷ Relying on Uber as a model for how crowdsourcing can “revolutionize an industry,”¹¹⁸ she argues that this concept may be the best solution for dealing with international interests in outer space.¹¹⁹ Mitchell’s proposition leans on a comparison of crowdsourcing to *Restatements*,¹²⁰ which she argues “have wielded

¹¹¹ Mitchell, *supra* note 7, at 430.

¹¹² *Id.* at 454.

¹¹³ *Id.* at 445.

¹¹⁴ *Id.* (emphasis added).

¹¹⁵ *Id.* at 448.

¹¹⁶ *Id.* at 449.

¹¹⁷ *Id.* at 448. Crowdsourcing “involves obtaining work, information, or opinions from a large group of people who submit their data via the Internet, social media, and smartphone apps.” See Marshall Hargrave, *Crowdsourcing: Definition, How It Works, Types, and Examples*, INVESTOPEDIA.COM (Nov. 20, 2022), <https://www.investopedia.com/terms/c/crowdsourcing.asp> [<https://perma.cc/MGF5-JNA5>].

¹¹⁸ Mitchell, *supra* note 7, at 451.

¹¹⁹ *Id.* at 453.

¹²⁰ *Restatements* are “a series of treatises that articulate the principles or rules for a specific area of law.” Legal Information Institute, *Restatement of the Law*, CORNELL LAW SCHOOL, https://www.law.cornell.edu/wex/restatement_of_the_law [<https://perma.cc/SN7S-C3R3>] (last visited Mar. 6, 2024). For more information on the importance of *Restatements*, see *The Story of ALI*, THE AMERICAN LAW INSTITUTE, <https://www.ali.org/about-ali/story-line/> [<https://perma.cc/FJ7E-P8CT>] (last visited Mar. 6, 2024) (chronicling the founding of the American Law Institution and its creation of the *Restatements*).

incredible influence” in the legal community.¹²¹ In implementing this crowdsourcing concept in the context of outer space, Mitchell argues that the international community could assemble a formalized team of experts made up of “legal professionals, government representatives, scientists, private business persons, and the lay public” as an advisory body to “make suggestions for the rules and laws governing an international space regime.”¹²²

While crowdsourcing is certainly a unique and interesting solution to resolve the legal questions outer space presents, it is unlikely such an approach would ever take hold. For one, how would these experts be chosen? More importantly, who would get to choose the individuals that make up this advisory body? These are important questions that Mitchell leaves unanswered. Furthermore, given that different countries have different types of legal systems,¹²³ it may be just as difficult to create a “crowdsourced” legal system for outer space as it would to negotiate an entirely new multilateral agreement. Ultimately, Mitchell’s suggestion of amending the Outer Space Treaty is the most feasible idea, but there are other models for an amendment that would provide a more concrete framework for the development of the commercial space sector than the Law of the Sea or the Antarctic Treaty.¹²⁴

C. The Outer Space Treaty, as is, allows for space mining.

Finally, Leslie Tennen argues that the Outer Space Treaty permits the collection and extraction of space resources, but because of the ambiguity inherent in the Treaty, she has chosen a unique avenue to support her conclusion.¹²⁵ Tennen claims that the idea of property rights in the context of outer space is “misplaced,”¹²⁶ arguing that “[t]he rights of entrepreneurs to conduct business in space relate to the legal ability to use and exploit extraterrestrial areas and materials for commercial gain. These are ‘enterprise rights,’ not ownership rights.”¹²⁷

Because of this purported distinction between enterprise rights and property rights, Tennen does not view the Treaty as a hindrance to the ability

¹²¹ Mitchell, *supra* note 7, at 451.

¹²² *Id.*

¹²³ While the United States’ legal system is based on common law, other signatories of the Outer Space Treaty, such as France, have a legal system based on civil law. See *What is the Difference Between Common Law and Civil Law?*, WASH. UNIV. OF ST. LOUIS SCH. OF L. (Jan. 28, 2014), <https://onlinelaw.wustl.edu/blog/common-law-vs-civil-law/> [https://perma.cc/QZ2P-GEX5].

¹²⁴ See *infra* Part IV.

¹²⁵ Tennen, *supra* note 30, at 285.

¹²⁶ *Id.*

¹²⁷ *Id.*

to commercialize outer space.¹²⁸ In fact, she goes so far as to say that Article II's non-appropriation doctrine actually "makes the commercialization of space possible" because it denies the ability of any singular entity from monopolizing one area or resource in perpetuity.¹²⁹ Ultimately, she concludes that "the language and context of the treaties authorize the use of extraterrestrial resources."¹³⁰

It remains to be seen if other countries would acquiesce to this interpretation of the Treaty. If not, ambiguities in the Outer Space Treaty could ultimately lead to conflict over the extracted resources or the asteroids from whence the resources were extracted. Leaving uncertainty in the hands of nations with competing interests, therefore, ultimately limits the sustainability of such an approach, and any feasible solution should not add to the inherent ambiguities in the Outer Space Treaty—rather, it should address them.¹³¹

III. ANALYSIS: THE NEED TO AMEND THE OUTER SPACE TREATY

Of the many approaches offered to address issues with the Outer Space Treaty, one thing has remained consistent: the urgent need for change. Without resolving the issue of ambiguity within Article II, the commercial space sector *cannot* adequately develop. Thus, not only does any feasible solution need to actually address the proposed problems, that solution must be passed in a timely manner and effectively address the ambiguities currently present in Article II.

The best avenue for change is to capitalize on the flexible nature of Article XV by amending the Outer Space Treaty.¹³² While there are admittedly some limits on the effectiveness of an amendment,¹³³ it is still the best path forward for a number of reasons. First, certain provisions within the Outer Space Treaty are of substantial importance to the international community and should thus be maintained.¹³⁴ Second, the current

¹²⁸ *Id.* at 287.

¹²⁹ *Id.* at 286.

¹³⁰ *Id.* at 290.

¹³¹ See *infra* Part III.

¹³² See *infra* Part IV.

¹³³ Notably, Article XV provides that an amendment "shall enter into force for each State Party to the Treaty accepting the amendments upon their acceptance by a majority of the State Parties to the Treaty on the date of acceptance by it." Outer Space Treaty, *supra* note 11, at art. XV (emphasis added). Thus, it must be conceded that an amendment would not likely be legally enforceable against signatory nations that choose to not accept the amendment, even if the amendment was accepted by a majority. However, for reasons discussed later, it is the position of this Note that the benefits of an amendment for individual nations, and the international community at large, will likely outweigh other considerations that would otherwise induce a nation to reject the proposed amendment. See generally *infra* Part III.B.

¹³⁴ See *infra* Part III.A.

geopolitical landscape does not reasonably lend itself to any other avenue constituting a feasible means of change.¹³⁵ Third, the economic incentives that would inherently come with the creation of a commercial space sector should incentivize acquiescence to an amendment.¹³⁶ Finally, an amendment would relieve the ambiguity surrounding Article II of the Treaty, thus likely alleviating some international tension in that regard.¹³⁷

Furthermore, to facilitate a timely and efficient change, the proposed amendment should include language similar to that of the CSLCA in order to provide a solid, unambiguous legal foundation from which the commercial space sector can adequately spread its roots and grow.¹³⁸

A. Withdrawal from the Outer Space Treaty is not tenable.

While some have suggested it is in the best interests of the United States to withdraw from the Outer Space Treaty,¹³⁹ doing so would not be advisable, both for the interests of the United States and the entire international community. The Outer Space Treaty has already addressed a number of key issues that should not be altered, and withdrawal could lead to increased international political instability.¹⁴⁰ Of particular relevance to this issue is Article IV's emphasis that outer space be used "exclusively for peaceful purposes."¹⁴¹ Considering efforts have already been made by the Chinese and Russian governments—or if you ask them, efforts made by the United States government—to militarize space,¹⁴² withdrawal from the Treaty could be the straw that breaks the camel's back in terms of maintaining peace within and beyond our atmosphere.

Furthermore, upon examination of other articles within the Treaty, it is evident that promoting a cohesive and peaceful international community was of paramount importance to the drafters of the Outer Space Treaty. Article III serves "the interest[s] of maintaining international peace and security and promoting international co-operation and understanding" by providing that the extraterrestrial activities of signatories be governed by international law.¹⁴³ Article VI and Article VII work in tandem with the

¹³⁵ See *infra* Part III.B.1.

¹³⁶ See *infra* Part III.B.2.

¹³⁷ See *infra* Part III.B.3.

¹³⁸ See *infra* Part IV.

¹³⁹ See, e.g., Fryhoff, *supra* note 100.

¹⁴⁰ See, e.g., Outer Space Treaty, *supra* note 11, at art. IV & XI (providing that outer space be used "exclusively for peaceful purposes" and establishing a framework that fosters communication between space-faring nations in relation to their respective extraterrestrial activities).

¹⁴¹ *Id.* at art. VI.

¹⁴² Richard Weitz, *Avoiding a Nuclear War in Space*, CHINA-US FOCUS (Aug. 28, 2020), <https://www.chinausfocus.com/peace-security/avoiding-a-nuclear-war-in-space> [https://perma.cc/S4BP-UKTF].

¹⁴³ Outer Space Treaty, *supra* note 11, at art. III.

Liability Convention to play a vital role in ensuring there is accountability for any damage caused by space accidents.¹⁴⁴ Article XI and Article XIII work to promote international communication, whether it pertains to the activities of nations or the resolution of disputes.¹⁴⁵ Thus, withdrawal from the Outer Space Treaty would undermine not only the important goals of those Articles but also the spirit of the Treaty and undo the important work of its drafters.

With a civil and military space program nearly as large as the rest of the world's space programs combined,¹⁴⁶ an American withdrawal from the Outer Space Treaty would be a cataclysmic event in the context of outer space and international law. Furthermore, an American withdrawal could potentially lead to other major space-faring nations following suit, thus jeopardizing not only the Outer Space Treaty but the entire extraterrestrial legal framework. Accordingly, the United States should maintain its role as one of the Outer Space Treaty's Depositary Governments¹⁴⁷ and remain a party to the Treaty.

B. An amendment to the Outer Space Treaty is the best path forward.

Others have proposed that an entirely new multilateral treaty¹⁴⁸ or regulatory scheme¹⁴⁹ must be procured to address these issues. In theory, that would certainly be the ideal path forward. However, the drafting of a comprehensive, multilateral treaty is no easy endeavor, and accomplishing such a task could take many years. Moreover, it is questionable whether a new, comprehensive multilateral treaty would hold legal force for all nations, even if it were signed and accepted by a vast majority.¹⁵⁰ All things

¹⁴⁴ See *supra* Parts I.A.1, I.A.2.

¹⁴⁵ See *supra* Part I.A.1; see also Outer Space Treaty, *supra* note 11, at art. XI & XIII.

¹⁴⁶ Lillian Posner & Evan Sankey, *The U.S. and Russia are Parting Ways in Space and That's Risky*, NAT'L INT. (May 7, 2021), <https://nationalinterest.org/feature/us-and-russia-are-parting-ways-space-and-thats-risky-184506> [<https://perma.cc/WUU6-35AD>].

¹⁴⁷ In the context of an international treaty, a depositary nation “keeps the original treaty texts and facilitates their signature, as appropriate.” Office of Treaty Affairs, *Treaties for Which the United States is Depositary*, U.S. DEP'T OF STATE, <https://www.state.gov/depositary-information/> [<https://perma.cc/SJS2-KVHW>] (last visited Feb. 17, 2023); Outer Space Treaty, *supra* note 11, at art. XIV § 2 (“This Treaty shall . . . be deposited with the Governments of the United States of America, the United Kingdom of Great Britain and Northern Ireland and the Union of Soviet Socialist Republics, which are hereby designated the Depositary Governments.”) (emphasis added).

¹⁴⁸ See, e.g., McSweeney, *supra* note 1, at 560.

¹⁴⁹ See *supra* Part II.B.

¹⁵⁰ To illustrate this point, an analogy can be drawn to a similar situation—in the context of deep seabed mining—involving the United Nations Convention on the Law of the Sea (UNCLOS). While the treaty has been signed by over 160 countries, some thirty nations, including the United States, have not signed the treaty. Despite the fact that most of the world has signed the UNCLOS, the United States has consistently asserted that the treaty

considered, an amendment to the Outer Space Treaty is the clearest and most efficient path forward.

1. The current geopolitical landscape necessitates the use of the amendment process.

One reason why an amendment is the most feasible course of action is the current international geopolitical landscape. The major space-faring nations—China, Russia, and the United States—would presumably have to be at the forefront of any new, exhaustive treaty sufficient to address space mining. However, in all likelihood, the current tensions amongst these nations are too great for an exhaustive treaty to be successfully negotiated.

The Trump administration led the United States to take a much more aggressive stance towards China over a number of concerns, including increased Chinese militarism, interference in the political systems of other nations, and other various economic concerns.¹⁵¹ However, though not without its hiccups,¹⁵² the Biden administration has sought to foster a better relationship with China through its more amicable approach of “strategic competition.”¹⁵³ While both President Biden and President Xi Jinping have expressed a desire to foster a better relationship between the two nations, the issues to be resolved are much more fundamental to the U.S.-Chinese relationship than the development of a commercial space sector.¹⁵⁴ Thus, there would likely be great difficulty in the negotiation of an entirely new multilateral treaty with China’s involvement.

Current tensions between the United States and Russia are even

is not enforceable against its citizens or corporations because it is not customary international law. See Steven Groves, *The U.S. Can Mine the Deep Seabed Without Joining the U.N. Convention on the Law of the Sea*, HERITAGE FOUND. (Dec. 4, 2012), <https://www.heritage.org/report/the-us-can-mine-the-deep-seabed-without-joining-the-un-convention-the-law-the-sea> [<https://perma.cc/J4D3-7JGT>].

¹⁵¹ Jeffrey A. Bader, David Dollar & Ryan Hass, *Assessing U.S.-China relations 2 years into the Trump presidency*, BROOKINGS INST. (Jan. 15, 2019), <https://www.brookings.edu/blog/order-from-chaos/2019/01/15/assessing-u-s-china-relations-2-years-into-the-trump-presidency/> [<https://perma.cc/Z7LW-TLXH>].

¹⁵² See, e.g. *EXPLAINER: Why is a Pelosi visit to Taiwan causing tension?*, ASSOC. PRESS (July 26, 2022), <https://apnews.com/article/china-pelosi-taiwan-visit-explainer-fd940b681b9a4165d2ace569bbfe33fb> [<https://perma.cc/CYN7-VWNN>]; David Sacks, *What the Biden-Xi Meeting Means for U.S.-China Relations*, COUNCIL ON FOREIGN REL. (Nov. 15, 2022), <https://www.cfr.org/blog/what-biden-xi-meeting-means-us-china-relations> [<https://perma.cc/2GVD-ZJKR>]; Patrick Reilly, *Chinese spy balloon tracked over northern US: Pentagon*, N.Y. POST (Feb. 2, 2023), <https://nypost.com/2023/02/02/chinese-spy-balloon-tracked-over-continental-us-pentagon/> [<https://perma.cc/GQC7-DFPD>].

¹⁵³ *U.S. Relations With China*, U.S. DEP’T OF STATE (May 12, 2021), <https://www.state.gov/u-s-relations-with-china/> [<https://perma.cc/KG78-MTYA>]; see also Didi Tang, *US-China relations are defined by rivalry but must include engagement, American ambassador says*, ASSOC. PRESS (Dec. 15, 2023), <https://apnews.com/article/nicholas-burns-china-ambassador-95cf351a74e6fb30e6b87879f4549ba1> [<https://perma.cc/LL22-5MRJ>].

¹⁵⁴ Sacks, *supra* note 152.

worse. While a June 2021 meeting between President Biden and President Vladimir Putin was a promising step towards improving the U.S.-Russian relationship,¹⁵⁵ it was short lived. Following Putin's initiation of a self-proclaimed "special military operation" into Ukraine,¹⁵⁶ the Russo-Ukrainian War has severely impacted U.S.-Russian relations. The subsequent imposition of massive economic sanctions, specifically designed to target the Russian economy and Russian oligarchs, have only made these already strained relations worse.¹⁵⁷

Given these international tensions, the utility of the amendment process greatly improves the likelihood that the issues limiting the development of a commercial space sector could be resolved without having to tackle international diplomacy with China and Russia. If the language of the amendment is targeted and precise, as is proposed here,¹⁵⁸ there would be little remaining ambiguity and presumptively much less for the countries to negotiate than if the international community started from scratch in the development of an entirely new treaty.

2. The international community is economically incentivized to acquiesce to an amendment to the Outer Space Treaty.

As a whole, the international community would also stand to economically benefit from the creation of a commercial space sector. Stanley Morgan has estimated that a global commercial space sector would "generate revenue of \$1.1 trillion or more" within the next 20 years.¹⁵⁹ Thus, just based on the size of this emerging sector, countries like China, Russia, and the United States would all likely see benefits within their own economies—benefits of which these countries are in desperate need.¹⁶⁰

¹⁵⁵ Steven Pifer, *U.S.-Russia relations, one year after Geneva*, BROOKINGS INST. (June 16, 2022), <https://www.brookings.edu/blog/order-from-chaos/2022/06/16/u-s-russia-relations-one-year-after-geneva/> [<https://perma.cc/5XNK-VE2X>].

¹⁵⁶ *Id.*

¹⁵⁷ See *The Impact of Sanctions and Export Controls on the Russian Federation*, U.S. DEP'T OF STATE (Oct. 20, 2022), <https://www.state.gov/the-impact-of-sanctions-and-export-controls-on-the-russian-federation/> [<https://perma.cc/TB8Z-9FM9>]; see also Amanda Macias, *U.S. imposes sanctions on Russia and Iran for wrongful detention and hostage-taking of American citizens*, CNBC (Apr. 27, 2023), <https://www.cnbc.com/2023/04/27/us-imposes-sanctions-on-russia-iran-for-hostage-taking.html> [<https://perma.cc/6CHU-BKFK>] (noting that the United States has also placed sanctions on Russia for reasons outside of the scope of the Russo-Ukrainian War, such as for the "wrongful" detention of U.S. citizen and journalist for the Wall Street Journal Evan Gershkovich).

¹⁵⁸ See *infra* Part IV.

¹⁵⁹ It should be noted that this valuation represents a world where there has not been an amendment to the Outer Space Treaty, and thus the scope of this projected commercial space sector is much smaller than one that encompasses commercial space mining. Accordingly, this valuation would likely be much larger if it accounted for a commercial space mining sector. See David Hsu & Nicolaj Siggelkow, *Why Big Business Is Making a Giant Leap into Space*, WHARTON SCH BUS. U. PA. (June 4, 2019), <https://knowledge.wharton.upenn.edu/article/commercial-space-economy/> [<https://perma.cc/MV4V-LNV3>].

¹⁶⁰ Mianxin Pei, *Despite the rhetoric, China's economy is struggling*, AUSTRALIAN STRATEGIC POL'Y INST. (Jan.

The COVID-19 pandemic severely impacted the country from which it originated,¹⁶¹ as China took a particularly aggressive approach to limit the spread of the virus, implementing a “zero-COVID policy that . . . cut them off from the rest of the world.”¹⁶² As a result, the Chinese economy was left with “deep scars” that have been further compounded by China’s geopolitical tensions with the United States and Europe.¹⁶³ One scholar has claimed that “[f]inding ways to improve relations with the West is . . . a prerequisite for economic recovery” in China.¹⁶⁴

Further, Russia’s economy is also in a period of uncertainty because of its invasion of Ukraine.¹⁶⁵ Currently, Russia faces sanctions that are “unprecedented in terms of scope, speed and coordination,” and, while the sanctions have not been as effective as initially predicted, “analysts say these measures are causing damage and could have [a] deeper impact going forward.”¹⁶⁶ When the Russo-Ukrainian War does inevitably end, Russia’s economy will likely be in shambles, and it will thus be looking to create economic growth by any means necessary. The procurement of a commercial space sector could draw appeal from Russia’s private sector, thus giving Russia reason to acquiesce to an amendment to the Outer Space Treaty.

Ultimately, these economic incentives could lead to improved international relations between the United States, China, and Russia. Despite previous grievances, sufficient economic incentives that would be universal

30, 2023), <https://www.aspistrategist.org.au/despite-the-rhetoric-chinas-economy-is-struggling/> [<https://perma.cc/LK9S-87SJ>] (explaining that while Chinese leadership has been steadily working towards economic recovery from the effects of COVID-19, China’s “economy may be sputtering for a while yet”); Jackie Northam, *Russia’s Economy is still working but sanctions are starting to have an effect*, NPR (Dec. 27, 2022), <https://wusfnnews.wusf.usf.edu/2022-12-27/russias-economy-is-still-working-but-sanctions-are-starting-to-have-an-effect> [<https://perma.cc/AG7K-JBLG>] (explaining that, despite Russia’s “sanction-proof” economy, the its economy will shrink as a result of the sanctions it currently faces); Thomas Barrabi, *Larry Summers: ‘Big Mistake’ to Think US Economy ‘Out of the Woods’*, N.Y. POST (Feb. 6, 2023), <https://nypost.com/2023/02/06/larry-summers-big-mistake-to-think-us-economy-out-of-the-woods/> [<https://perma.cc/N4RM-KS2M>] (explaining that while the U.S. could have a soft landing from its record inflation, a recession is still very possible).

¹⁶¹ See Dr. Joel Zinberg, *Letter confirms Wuhan lab’s COVID-19 leak was funded by US taxpayers*, N.Y. POST (Nov. 4, 2021), <https://nypost.com/2021/11/04/letter-confirms-wuhan-lab-virus-study-was-funded-by-taxpayers/> [<https://perma.cc/Z9B6-XLEQ>].

¹⁶² Yew Lun Tian & Joyce Zhou, *China reopens borders in final farewell to zero-COVID*, REUTERS (Jan. 8, 2023), <https://www.reuters.com/world/china/china-reopens-borders-final-farewell-zero-covid-2023-01-08/> [<https://perma.cc/BGT2-AHNA>].

¹⁶³ Pei, *supra* note 160.

¹⁶⁴ *Id.*; see also Laura He, *China’s economy had a miserable year. 2024 might be even worse*, CNN (Dec. 29, 2023), <https://www.cnn.com/2023/12/27/economy/china-economy-challenges-2024-intl-hnk/index.html> [<https://perma.cc/XFK3-NFJE>] (highlighting the numerous issues China’s economy currently faces, including its declining economic growth rate, the impact of “zero-COVID” policies, and the recent Chinese real estate and shadow banking sector crises).

¹⁶⁵ Northam, *supra* note 160.

¹⁶⁶ *Id.*; see also Clare Sebastian and Hanna Ziady, *The spiraling cost of war means growing economic pain for Russia*, CNN (Aug. 28, 2023), <https://www.cnn.com/2023/08/28/economy/russia-military-spending-economic-impact/index.html> [<https://perma.cc/QDR3-ZQSY>] (noting that Russia’s budget deficit has “widened sharply since the start of the [Russo-Ukrainian] war,” pushing the country even further into debt).

in nature, as is the case here, could improve relations among these signatories.¹⁶⁷ Accordingly, the promise of a prosperous commercial space sector provides ample economic incentive for China and Russia—nations that might otherwise be hesitant to come to the negotiating table with the United States—to acquiesce to an amendment.

3. An amendment could ease international tensions that arose in response to the United States' passage of the CSLCA.

An amendment could also ease some international tensions related to the United States' unilateral efforts in passing the CSLCA, especially given that some countries were upset with the Act's implications on the rights of others within the international community.¹⁶⁸

Specifically, Russia's space agency, Roscosmos, has viewed unilateral action by the United States as a deterrent to international cooperation in outer space.¹⁶⁹ The agency even went so far as to brand these American efforts as “colonialism” and further accused the United States of having “plans to actually take over other planets.”¹⁷⁰ While “[t]he current International Space Station is effectively a joint U.S.-Russia facility,” the director of Russia's space program rejected an offer to join the United States in the Artemis Program¹⁷¹ because the proposal was “too U.S. centric.”¹⁷²

Furthermore, two scholars from China and Hong Kong, respectively, argue that “the U.S. fails to pay due regard to the fact that the international community has yet to reach a consensus on the issues of the legal character of and the attribution of the right over space resources.”¹⁷³ The two scholars

¹⁶⁷ See William T. Long, *Economic Incentives and International Cooperation: Technology Transfer to the People's Republic of China, 1978-86*, 28 J. PEACE RSCH. 175, 188 (1991) (finding that if economic incentives are not introduced in a universal fashion, they may “carry the possibility of destabilizing international relations”). Accordingly, it can be inferred that economic incentives that provide a universal benefit for all parties could have the potential to improve geopolitical relations.

¹⁶⁸ See Shengli Jiang & Yun Zhao, *The Aftermath of the US Space Resource Exploration and Utilization Act: What's Left for China?*, 11 J. E. ASIA INT'L L. 9, 10-11 (2018); see also *Russia Compares Trump's Space Mining Order to Colonialism*, MOSCOW TIMES (Apr. 7, 2020), <https://www.themoscowtimes.com/2020/04/07/make-quarantine-art-a69902> [<https://perma.cc/W68T-24FA>].

¹⁶⁹ MOSCOW TIMES, *supra* note 168.

¹⁷⁰ *Id.*; It bears noting that Russian hostility towards the CSLCA is likely founded more out of spite against the United States rather than a disagreement about whether space resources should be harvested or the legality of the CSLCA. See Laura C. Byrd, *Soft Law in Space: A Legal Framework for Extraterrestrial Mining*, 71 EMORY L. J. 801, 820 (2022) (noting that Russia began negotiating with Luxembourg to “develop a framework agreement for cooperation between the two countries in space mining activities” in 2019, only to turn around in the same year and characterize the Artemis Accords as an effort to “expropriate outer space” and an attempt to “actually seize territories of other planets”).

¹⁷¹ The Artemis Program represents the recent extraterrestrial efforts of the United States and other nations that were a product of the Artemis Accords. See *supra* Part I.A.4.

¹⁷² Posner & Sankey, *supra* note 146.

¹⁷³ Jiang & Zhao, *supra* note 168, at 11.

go on to suggest that China should respond to the passage of the Act by seeking to establish a “global governance mechanism for space exploration and utilization.”¹⁷⁴

Any effort to amend the Outer Space Treaty would inevitably bring China and Russia to the bargaining table to some extent, and this could be an opportunity for the United States to try and ease the international tensions it created by passing the CSLCA. In exchange for Chinese acceptance of the amendment, the United States could agree in principle to work with China and other major space-faring nations to create a “global governance mechanism” to effectively regulate and control this emerging sector, as has been suggested.¹⁷⁵ Proposing an amendment would also alleviate the principal complaint of China and Russia,¹⁷⁶ as negotiation and resolution of this issue would inherently permit the international community to reach a general consensus on the legal issue of rights over space resources. Thus, the United States would no longer be acting unilaterally, thereby assuaging the major concerns of China and Russia.

It is also worth noting that China recently expressed interest in working with the United States “to expand space cooperation” at the 2021 U.S.-China summit in Alaska.¹⁷⁷ This is a promising sign, and bringing China as well as Russia to the table on this issue will only serve to foster a better relationship with these nations. Ultimately, while it may be overly optimistic to expect that China or Russia could agree on anything with the United States given the numerous geopolitical issues outside the context of outer space,¹⁷⁸ it is certainly worth the effort given the potential risks to mankind should a commercial space sector not be successfully established.¹⁷⁹

IV. RESOLUTION: PROPOSED AMENDMENT TO THE OUTER SPACE TREATY

While the Outer Space Treaty, because of its ambiguities, is currently insufficient to address space mining and foster the development of a commercial space sector, the best path forward to address this deficiency is to amend the Outer Space Treaty pursuant to Article XV. Specifically, this amendment should revise Article II by creating additional subsections that specifically address the legal rights of non-governmental entities over any space resources they collect. The current language of Article II—that “[o]uter

¹⁷⁴ *Id.* at 27.

¹⁷⁵ *See id.*

¹⁷⁶ *Id.* at 10-11; *see also* MOSCOW TIMES, *supra* note 168.

¹⁷⁷ Posner & Sankey, *supra* note 146.

¹⁷⁸ *See generally supra* Part III.B.

¹⁷⁹ *See supra* Introduction.

space . . . is not subject to *national* appropriation”¹⁸⁰—could remain the same and would thus become subsection one of Article II.

However, the proposed amendment would include two additional subsections. Using § 51303 of the CSLCA as a model,¹⁸¹ subsection two of the amended Article II should read:

Any citizen or non-governmental entity of any signatory engaged in commercial recovery of an asteroid resource, or a space resource, shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable international law.

With this construction, no longer would nations be able to successfully argue that the prohibition on national appropriation also applies to non-governmental entities.¹⁸² This amendment construction clearly provides that *any* citizen or non-governmental entity from *any* signatory would be able to legally recover resources from outer space. Optimally, this would open the international floodgates for the development of a commercial space sector. It would also likely be beneficial for garnering acceptance from other major space-faring nations, such as China or Russia, if the amendment allows their markets to also access those resources. While China and Russia may have originally been opposed to the unilateral action of the United States by way of the CSLCA,¹⁸³ that opposition could foreseeably dissipate if their respective citizens also have a legal basis on which they may extract resources from celestial bodies and outer space at large.

Subsection three of the amended Article II should also include additional language, again modeled after the CSLCA, that defines key terms in subsection two. Specifically, subsection three should provide a definition for both “asteroid resource” and “space resource” as they apply to subsection two of the proposed amendment. The definition of “asteroid resource” present in the CSLCA, “a space resource found on or within a single asteroid,”¹⁸⁴ is sufficient for the purposes of this amendment and should thus be maintained.

However, the definition of “space resource” provided in subsection three should deviate slightly from the CSLCA’s definition—“an abiotic

¹⁸⁰ Outer Space Treaty, *supra* note 11, at art. II.

¹⁸¹ See CSLCA, *supra* note 75, at § 51303.

¹⁸² See *supra* Part II.C.

¹⁸³ See *supra* Part III.B.3.

¹⁸⁴ CSLCA, *supra* note 75, at § 51301(1).

resource in situ in outer space,” which “includes water and minerals”—to be more precise.¹⁸⁵ Accordingly, the definition of “space resource” should read as follows: “an abiotic resource, *that could not in and of itself be considered a celestial body*, in outer space, including water and minerals.” Because the amendment seeks to alleviate the ambiguities inherent in Article II, this definition is important as it specifically clarifies the meaning of “in situ” featured in the CSLCA’s definition of space resources.

Leaving the term “in situ” in the definition is problematic because its inclusion infers the act’s prohibition of the appropriation of an entire asteroid,¹⁸⁶ but does not explicitly state so. Thus, leaving the term “in situ” would directly counteract the very purpose of an amendment to the Treaty: to alleviate ambiguity so that countries have nothing to infer. Accordingly, the provided definition should be as precise as possible to avoid this problem and any potential confusion surrounding its application once the proposed amendment becomes operative.

Inevitably, as a result of the creation of a new commercial space sector, other issues will later arise that will necessitate the creation of additional international laws regulating space mining. But the goal of this amendment is not to be exhaustive, but rather to provide an efficient avenue for this new sector to take hold. Accordingly, an amendment should only be viewed as a relatively temporary solution to this problem. The commercial sector cannot truly develop without a legal basis for companies to claim celestial resources—a feat that requires immense investment and work—so the most important and appealing aspect of the amendment process is the speed from which this necessary and unambiguous legal framework can be established.

In time, when a need for further change arises, the international community should work to compose a comprehensive legal framework to address any loopholes or other issues that appear as a result of the amendment. To that end, another comprehensive international legal regime, such as the United Nations Convention on the Law of the Sea, as has been suggested,¹⁸⁷ could be of great utility to the international community. To thoroughly explore the creation of a comprehensive legal framework that addresses future problems in international space mining, however, is beyond the scope of this Note and need not be fully addressed at this moment.

¹⁸⁵ *Id.* § 51301(2)(A) & (B).

¹⁸⁶ Recall that “in situ” infers the Act’s prohibition of commercial entities from extracting an entire asteroid from outer space. See *supra* notes 85–89 and accompanying text.

¹⁸⁷ Craig Foster, *Excuse Me, You’re Mining My Asteroid: Space Property Rights and the U.S. Space Resource Exploration and Utilization Act of 2015*, 2016 I. ILL. J.L. TECH. & POL’Y 407, 429 (2016).

CONCLUSION

Human consumption will only continue to increase, and, inevitably, the Earth will run out of the resources society needs to continue to function. Thus, it only makes sense that our society look for a solution beyond our atmosphere. In order to make this possibility feasible, the commercial space sector must be allowed to develop, and the need for a timely and effective method that provides a comprehensive legal foundation from which this sector can grow is essential.

As it currently reads, the Outer Space Treaty is too ambiguous for the development of a commercial space mining sector to be feasible. This problem has been recognized by most of the international community,¹⁸⁸ and many scholars have attempted to solve this issue.¹⁸⁹ While the international community has plenty of options, the most feasible option is to amend the Outer Space Treaty because of the speed from which change can occur. To that end, implementing language from the CSLCA serves as a great legal framework from which to efficiently develop an amendment.¹⁹⁰ Accordingly, the proposed amendment provides clear, unambiguous language that will serve as a guide for countries around the world seeking to develop a commercial space sector.

This amendment is, admittedly, but a temporary solution. Ultimately, an exhaustive multilateral treaty would likely be most appropriate in order to address the many issues that will inevitably arise with the creation of a new, extraterrestrial economic sector.¹⁹¹ But without a more definitive legal foundation from which to launch, that new economic sector may never reach lift off. If companies are assured that they have a legal right to the precious metals they find in outer space, they will be more incentivized to expand and develop an international commercial space sector—a development that could change the course of human history.

¹⁸⁸ See Lant, *supra* note 27.

¹⁸⁹ See *supra* Part II.

¹⁹⁰ See CSLCA § 51303.

¹⁹¹ One question that would likely remain is whether non-space-faring nations would be left behind. Considering that the majority of the Treaty's signatory nations are non-space-faring, this is certainly a notable concern in terms of the amendment's initial passage by way of approval from a majority of signatory nations. Accordingly, while not the focus of this Note, this interest would likely have to be addressed by the United States in proposing this amendment. One possible way to address this issue would be to permit and encourage non-space-faring nations to invest money into companies that engage in space mining. In return, these non-space-faring nations would be legally entitled to a portion of the proceeds from that mining venture in accordance with the percentage of funding for the mission they contributed. To illustrate, if a space mining expedition cost \$100 million USD, and a non-space-faring nation contributed \$15 million USD to support that expedition, the non-space-faring nation would be legally entitled to 15% of the resulting proceeds from that mining expedition. This would allow non-space-faring nations to financially benefit from this amendment to the Treaty, and thus give them greater incentive to accept the amendment.