

# Miners on the Moon: Taking the Framework from the Law of the Sea to Space

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## Abstract

*Terrestrial Mining historically answered global demand for minerals and metals. But, as Earth's once-plentiful mines diminish, companies and states seek new avenues to meet the world's ever-increasing resource demand. Instead of down, scientists are now looking up at the stars, to Space Mining, which entails resource extraction from celestial bodies. It is not yet economically feasible, but strides are slowly being made in turning this futuristic industry into a reality. Currently, Space Mining has limited regulation, creating the potential for conflict over space's valuable resources. Therefore, the international community should begin preparing for the industry's eventual rise by creating a regulatory and dispute resolution framework. This comment will advocate for incorporating the regulatory and dispute resolution regimes of Deep-Sea Mining in the space context. The two main modes are (1) an industrial regulator akin to the "International Seabed Authority" and (2) an International Arbitration Panel dedicated to handling Space Mining disputes like the "Seabed Disputes Chamber." These frameworks can properly monitor potential externalities while still providing incentives to encourage discovery.*

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## Table of Contents

I. Introduction.....	3
A. What is Space Mining.....	5
B. Why Space Mining is an Important Issue.....	6
C. What Is Deep-Sea Mining.....	7
D. Main Argument and Solution.....	8
II. Discussion of Current International Space Mining Law.....	9
A. The Outer Space Treaty.....	9
B. The Moon Agreement.....	12
C. The Artemis Accords.....	14
D. Current Domestic Law Examples.....	15
1. U.S.....	15
2. Japan.....	16
3. The two regimes compared.....	16
III. Discussion of Current International Deep-Sea Mining Law.....	17
A. U.N. Convention on the Law of the Sea (UNCLOS).....	18
B. The International Seabed Authority.....	19
C. The Seabed Disputes Chamber and Dispute Resolution.....	20
D. Example Domestic Countries' Deep-Sea Mining Law.....	21
IV. A Hypothetical Space Mining Dispute.....	22
A. Space Mining in the U.S.....	22
B. Space Mining in Japan.....	23
C. The Dispute.....	24
D. Finding a Solution.....	25
V. Applying Deep-Sea Mining to Space Mining.....	26
A. A Permanent Administrative Body to Regulate Space Mining.....	27
B. A Specialized Arbitration Panel to Handle Space Mining Disputes.....	28
C. Criticisms and Counter Arguments.....	29
VI. Conclusion.....	31

## I. INTRODUCTION

As Earth's resources deplete, states and corporations are searching for the next place to find precious minerals and metals. Some look to the ocean while others have turned their attention to the stars. A new economic frontier is developing: Space Mining.<sup>1</sup> Space Mining refers to the extraction of valuable resources (such as precious minerals, water, or other raw materials) from celestial bodies (such as the moon or asteroids) in outer space.<sup>2</sup> International and domestic law around Space Mining has developed,<sup>3</sup> but most restrictions on current activities relate to technological feasibility.<sup>4</sup> There are very few instances of spacecraft successfully taking material from celestial bodies,<sup>5</sup> and the prohibitive cost of these missions makes the possibility of organizing profitable Space Mining operations still years away.<sup>6</sup> However, this has not stopped both public and private entities from investing in the endeavor with the hope of economic payoff down the line.<sup>7</sup>

Space Mining presents new opportunities for States to acquire precious metals, minerals, and freshwater without the environmental degradation resulting from Terrestrial mining.<sup>8</sup> Despite the technological limitations, governments and corporations will pursue the endeavor due to its potential benefits. Asterank, a database on planetary resources, estimates the potential profit from mining some asteroids to be in the billions or even trillions of dollars.<sup>9</sup> Law must, therefore, prepare to adjudicate over the conflicts that arise out of State and non-state entities' efforts to reap the benefits of a potentially lucrative celestial extraction industry.<sup>10</sup> The first entity to successfully mine in space would have disproportionate access to materials compared to the rest of the world.

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<sup>1</sup> Sarah Scoles, *In the Race for Space Metals Companies Hope to Cash In*, UNDARK, (May 8, 2024) [perma.cc/3R32-5BGR](https://perma.cc/3R32-5BGR).

<sup>2</sup> *Space Mining*, SPACE GENERATION ADVISORY COUNCIL, (May 8, 2022) [perma.cc/2EBX-UC9G](https://perma.cc/2EBX-UC9G).

<sup>3</sup> W. Spencer Haywood, *Commercial Space Mining Within the Framework of The Outer Space Treaty: Vexing Issue or Simple Solution?*, 62 U. LOUISVILLE L. REV. 813, 815–22 (2024).

<sup>4</sup> Alex Gilbert, *Mining in Space Is Coming*, MILKEN INST. REV., (Apr. 26, 2021) [perma.cc/E9WU-535T](https://perma.cc/E9WU-535T).

<sup>5</sup> *Hayabusa*, NASA, <https://perma.cc/RX72-XS29> (last visited Nov. 13, 2024).

<sup>6</sup> *Id.* (stating the cost of the “Hayabusa Spacecraft” was \$100 Million, yet there did not appear to be any valuable material derived from the material taken).

<sup>7</sup> See generally Shriya Yarlagadda, *Economics of the Stars: The Future of Asteroid Mining and The Global Economy*, HARV. INT'L REV., (Apr. 8, 2022) [perma.cc/HVY4-JKNN](https://perma.cc/HVY4-JKNN).

<sup>8</sup> See *Space Mining*, *supra* note 2 (describing space as a place that potentially may hold valuable resources including minerals and fresh water).

<sup>9</sup> See *Asterank*, ASTERANK, [perma.cc/4KPC-5FKN](https://perma.cc/4KPC-5FKN) (last visited Oct. 12, 2025).

<sup>10</sup> Ramin Skibba, *Mining in Space Could Lead to Conflicts on Earth*, NAUTILUS, (Apr. 18, 2016) [perma.cc/4A5N-SPKD](https://perma.cc/4A5N-SPKD).

At the international level, there is a lack of clarity on whether the current treaty framework permits Space Mining in the first place.<sup>11</sup> The main pieces of international law on the subject are: The Outer Space Treaty,<sup>12</sup> a widely adopted U.N. resolution, the Moon Agreement,<sup>13</sup> a less supported U.N. resolution, and the Artemis Accords,<sup>14</sup> a non-binding multilateral treaty spearheaded by the United States that intends to build off The Outer Space Treaty.<sup>15</sup> There is currently disagreement over whether The Outer Space Treaty allows Space Mining.<sup>16</sup> While the Moon Agreement explicitly prohibits Space Mining, no space-faring nation has signed the Agreement.<sup>17</sup> In contrast, the Artemis Accords both encourage Space Mining and interpret The Outer Space Treaty as allowing the activity.

In addition to these three international treaties, countries have created domestic frameworks to encourage private entities to pursue Space Mining operations.<sup>18</sup> For example, the U.S. passed the U.S. Commercial Space Launch Competitiveness Act<sup>19</sup> (“USCSLCA”) in 2015 to discourage government barriers in commercial space mining,<sup>20</sup> and Japan passed the “Space Resources Act” in 2021, encouraging businesses to submit plans for Space Mining permits.<sup>21</sup>

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<sup>11</sup> See Braden Anderson, *Mining the Milky Way: How to Bring America's Extraterrestrial Excursions Back into Compliance with International Obligations*, 87 J. AIR L. & COM. 637 (2022).

<sup>12</sup> G.A. Res. 2222 (XXI), Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies Outer Space Treaty, Dec. 19, 1966, UNOOSA, 610 U.N.T.S. 205.5 [hereinafter OUTER SPACE TREATY].

<sup>13</sup> G.A. Res. 34/68, Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (The Moon Agreement), Dec. 18, 1979 [hereinafter MOON AGREEMENT].

<sup>14</sup> The Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes, NASA, (Oct. 13, 2020) [hereinafter ARTEMIS ACCORDS] [perma.cc/Y976-5ZRQ](https://perma.cc/Y976-5ZRQ).

<sup>15</sup> Note that interpretation of all of these treaties will be governed by the Vienna Convention, which as its own treaty, tells countries how their treaties are supposed to be interpreted: G.A. Res. 2166 (XXI) and G.A. Res. 2287 (XXII), Vienna Convention on the Law of Treaties, May 23, 1969, 1155 U.N.T.S. 331, 8 I.L.M. 679 (1969).

<sup>16</sup> Paul B. Larsen, *Is There A Legal Path to Commercial Mining on the Moon?*, 83 U. PITT. L. REV. 1, 14 (2021) (“The authors of the Building Blocks Proposal and the Artemis Accords interpret OST Article II to allow the use of lunar mines without claiming property rights.”).

<sup>17</sup> Carolyn Henson, *UN Moon Treaty Falling to US Opposition Groups*, L5 NEWS, (Mar. 1982) [perma.cc/7KBZ-KXKS](https://perma.cc/7KBZ-KXKS).

<sup>18</sup> *National Space Law*, UNITED NATIONS, [perma.cc/PKB6-JZLH](https://perma.cc/PKB6-JZLH) (last visited Nov. 16, 2024).

<sup>19</sup> U.S. Commercial Space Launch Competitiveness Act, 51 U.S.C. § 10101 (2015) [hereinafter USCSLCA].

<sup>20</sup> *Id.*

<sup>21</sup> Act on the Promotion of Business Activities for the Exploration and Development of Space Resources, Act No. 83 of 2021, art. 1 (Japan) <https://perma.cc/UP4U-KH49> [hereinafter JAPAN SPACE MINING LAW].

## A. What is Space Mining

There is no legal definition for what falls under the umbrella of “Space Mining.” Notably, The Outer Space Treaty, the pre-eminent international space treaty, does not contain a definition for Space Mining.<sup>22</sup> For this analysis, “Space Mining” will refer to the process of extracting valuable resources from celestial bodies such as asteroids, moons, and other planets for use on Earth or in space exploration.<sup>23</sup>

Currently, Space Mining missions cost hundreds of millions of dollars and fail to generate commercially valuable material. Any operation requires significant up-front investment without a guarantee of economic payoff. However, recent developments in Space Exploration have engendered optimism for the industry’s future.<sup>24</sup> On June 13, 2010, Japan launched the “Hayabusa” mission, which became the first spacecraft to take celestial samples from an asteroid.<sup>25</sup> Though a success, Hayabusa displayed Space Mining’s issues; the operation cost over 100 million dollars, and the extracted particles were less than a gram of space dust; this return on investment was a pittance considering the operation’s costs.<sup>26</sup> In 2023, NASA launched the OSIRIS-REx satellite, which collected around 121 grams of rocks and dust from the asteroid “Bennu.”<sup>27</sup> The material is being used for scientific purposes, and its commercial value is unknown; nevertheless, the technological gains are encouraging. Over the next decade, both private entities, such as AstroForge,<sup>28</sup> and states around the globe,<sup>29</sup> are planning to launch missions with the hopes of economically profitable Space Mining down the line.<sup>30</sup>

Despite its economic promise, not all aspects of Space Mining are beneficial, and the practice has been criticized for its potentially negative externalities. Rockets release black carbon particles upon launch that accumulate in the

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<sup>22</sup> See generally OUTER SPACE TREATY, *supra* note 12.

<sup>23</sup> Egemen Demirer, *What is Space Mining and Space Resources*, RSCH. GATE, (Aug. 4, 2023) [perma.cc/CC3S-3CYK](https://perma.cc/CC3S-3CYK).

<sup>24</sup> Devika Rao, *We’re in the Golden Age of Space Exploration*, THE WEEK U.S., (Mar. 8, 2024) [perma.cc/XCL3-2L7F](https://perma.cc/XCL3-2L7F).

<sup>25</sup> See *Hayabusa*, *supra* note 5.

<sup>26</sup> *Id.*

<sup>27</sup> *OSIRIS-REx In Depth Summary*, NASA, [perma.cc/X4KN-CUT6](https://perma.cc/X4KN-CUT6) (last visited Nov. 13, 2024).

<sup>28</sup> ASTROFORGE, (outlining the mission of a California based start-up created by two former NASA and SpaceX scientists).

<sup>29</sup> Amy Gunia, *Minerals Are In Short Supply on Earth. This Startup Wants to Mine Asteroids*, CNN WORLD, (Apr. 23, 2024) [perma.cc/W45D-MW2N](https://perma.cc/W45D-MW2N) (explaining that countries with mission plans to bring samples back to earth include China, the United Arab Emirates (U.A.E.), and the U.S.).

<sup>30</sup> *Id.*

atmosphere, absorb solar radiation, and warm the surrounding air.<sup>31</sup> This both increases stratospheric temperatures and causes changes in global circulation of air particles that, in turn, weaken the ozone layer,<sup>32</sup> which protects the earth from high levels of UV radiation.<sup>33</sup> Space Mining also has the potential to generate “Space Junk,” debris or waste material floating in space that can potentially damage spacecraft or crash land on Earth.<sup>34</sup>

## B. Why Space Mining is an Important Issue

There are two main reasons why Space Mining is an industry that needs regulation. First, armed conflicts could arise over resources in the near future, with Space Mining as a potential subject of contention.<sup>35</sup> States will undoubtedly compete for unfettered access to the potentially valuable minerals, metals, and other resources on celestial bodies, resulting in Earth-side armed conflict between competing parties.<sup>36</sup> Second, Space Mining could be a potential solution for reducing the overall environmental footprint of human activity.<sup>37</sup> Terrestrial mining operations alone are extremely harmful to the planet, and Space Mining has the potential to replace them.<sup>38</sup>

On the issue of armed conflict, technological innovation will increase the demand for valuable minerals and metals.<sup>39</sup> Critical minerals such as copper, lithium, nickel, and cobalt power the electronics people use every day.<sup>40</sup> But, predictions from the U.N. Environment Programme warn that we are using resources at an “unsustainable rate.”<sup>41</sup> Resource extraction has tripled since 1970

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<sup>31</sup> Christopher Maloney et al., *The Climate and Ozone Impacts of Black Carbon Emissions From Global Rocket Launches*, 127 J. GEOPHYSICAL RSCH. 1 (June 1, 2022).

<sup>32</sup> *Id.*

<sup>33</sup> *Health and Environmental Effects of Ozone Layer Depletion*, EPA, [perma.cc/TE8B-WM6G](https://perma.cc/TE8B-WM6G) (last visited Nov. 13, 2024).

<sup>34</sup> *A Mission to Control Space Junk and Asteroids*, EUR. COMM’N, (Nov. 30, 2017) [perma.cc/72NX-32RR](https://perma.cc/72NX-32RR).

<sup>35</sup> Timiebi Aganaba, *Only Effective Space Governance Can Prevent Future Conflict*, CIGI, (Jan. 24, 2024) [perma.cc/Y53F-6LHT](https://perma.cc/Y53F-6LHT).

<sup>36</sup> *Id.*

<sup>37</sup> Josh Sims, *Are We On the Verge of Mining Metals from the Asteroids Above Earth*, BBC, (Mar. 23, 2025) [perma.cc/9X7C-UURG](https://perma.cc/9X7C-UURG).

<sup>38</sup> *Id.*

<sup>39</sup> Lola Woetzel et al., *How Technology is Reshaping Supply and Demand for Natural Resources*, MCKINSEY GLOB. INST., (Feb. 15, 2017) [perma.cc/5NHF-WVYF](https://perma.cc/5NHF-WVYF).

<sup>40</sup> *A New Frontier for Global Energy Security: Critical Minerals*, INT’L ENERGY AGENCY, [perma.cc/K7ZQ-AWVK](https://perma.cc/K7ZQ-AWVK) (last visited Mar. 26, 2025).

<sup>41</sup> *We’re gobbling up the Earth’s resources at an unsustainable rate*, U.N. ENV’T PROGRAMME, <https://perma.cc/BR8S-HCTZ> (last visited Oct. 12, 2025).

and a “fivefold” increase in the use of non-metallic minerals.<sup>42</sup> There is a risk that in the next 100 years, Earth will run out of copper, and other resources such as “gold, boron, [and] silver,” could be close behind.<sup>43</sup> These resources are not easily accessible<sup>44</sup> and their acquisition is susceptible to disruption by social or political instability in countries where their deposits are concentrated.<sup>45</sup> States are trying to find more reliable sources of these minerals and since there is no regulatory body, it would be a race to extract materials from the most valuable celestial bodies in the solar system, potentially causing conflict over control of these resources.<sup>46</sup>

Regarding environmental concerns, Space Mining has the potential to be a more efficient and less carbon-intensive method to meet resource needs.<sup>47</sup> Mining on Earth is an expensive and unsustainable practice that pollutes freshwater, destroys land, and disproportionately affects impoverished communities.<sup>48</sup> If Space Mining has the resource potential to replace Terrestrial mining, critical mineral supplies can be secured without destructive externalities.<sup>49</sup> Space Mining could meet demand for valuable minerals without the devastating environmental effects on the planet.

### C. What Is Deep-Sea Mining

Space Mining is yet to be economically feasible, but other futuristic industries have gone from science fiction to reality, chief among them Deep-Seabed Mining (referred to in this analysis as “Deep-Sea Mining”). The seafloor is rich in valuable metals, including iron, copper, nickel, and cobalt.<sup>50</sup> Deep-Sea Mining is “the process of extracting valuable minerals and resources from the ocean floor.”<sup>51</sup>

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<sup>42</sup> *Id.*

<sup>43</sup> Theo Henkens, *Scarce Mineral Resources: Extraction, Consumption and Limits of Sustainability*, 169 RES., CONSERVATION & RECYCLING 1, 5 (2021).

<sup>44</sup> Gregory Wischer, *The U.S. Military and NATO Face Serious Risks of Mineral Shortages*, CARNEGIE ENDOWMENT FOR INT’L PEACE, (Feb. 12, 2024) [perma.cc/PQ93-4VRU](https://perma.cc/PQ93-4VRU).

<sup>45</sup> Ker Than, *Critical Minerals Scarcity Could Threaten Renewable Energy Future*, STAN. DOERR SCH. SUSTAINABILITY, (Jan. 17, 2018) [perma.cc/929D-QEPR](https://perma.cc/929D-QEPR).

<sup>46</sup> Rebekah Shields, *Towards A New Orbit: Addressing the Legal Void in Space Mining*, 40 AM. U. INT’L L. REV. 229, 231 (2024).

<sup>47</sup> *Id.*

<sup>48</sup> Sammy Witchalls, *The Environmental Problems Caused By Mining*, EARTH.ORG, (Apr. 3, 2022) [perma.cc/KX5S-6CZD](https://perma.cc/KX5S-6CZD).

<sup>49</sup> *Id.*

<sup>50</sup> Michael Lodge, *The International Seabed Authority and Deep seabed Mining*, U.N. CHRONICLE, (May 16, 2017) [perma.cc/V975-HL2J](https://perma.cc/V975-HL2J).

<sup>51</sup> *Deep-Seabed Mining*, MARINE CONSERVATION INSTITUTE, [perma.cc/BH7S-6GX7](https://perma.cc/BH7S-6GX7) (last visited Nov. 14, 2024).

This includes three different strategies.<sup>52</sup> First is dredging, which is the use of a large underwater machine that sucks up sediment from the ocean floor.<sup>53</sup> Second is hydraulic mining, where high-pressure water jets break up the ocean floor and extract minerals.<sup>54</sup> Third is subsea drilling, drilling into the ocean floor to access minerals below the surface.<sup>55</sup> Deep-Sea Mining used to be technologically infeasible—similar to how Space Mining is now—but is slowly becoming a part of global resource production.

Deep-Sea Mining makes for an adequate analogue to modern-day Space Mining because both are seen as potential replacements for conventional mining despite a high front-end cost for investing parties,<sup>56</sup> and the main treaties that police the industries have similar language.<sup>57</sup> However, unlike Space Mining, Deep-Sea Mining has both a regulatory and dispute settlement framework. The U.N. Convention on the Law of the Seas (UNCLOS) established the International Seabed Authority (ISA) to ensure the deep seabed and its resources are used for the “common heritage of [hu]mankind.”<sup>58</sup> Disputes are settled by the International Tribunal for the Law of the Sea (ITLOS), with a special body known as the Seabed Disputes Chamber (SDC) to handle seabed disputes specifically.<sup>59</sup>

#### D. Main Argument and Solution

The current international framework is ill-equipped to handle the potential problems of Space Mining. Though having any regulation of the industry has been criticized, there are treaties and laws on the issue, and the international community should work to improve them. By ironing out a regulatory framework early and seeing its stability, entities will be more encouraged to put in the considerable up-front investment it takes for successful Space Mining.

First, there should be a dedicated international governing body that gives out permits to Space Mine. A regulatory body can ensure that Space Mining is being done in a safe, environmentally sustainable manner, and is a proactive way to prevent conflicts by distributing mining rights ahead of time. Second, there should

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<sup>52</sup> *Id.*

<sup>53</sup> *Id.*

<sup>54</sup> *Id.*

<sup>55</sup> *Id.*

<sup>56</sup> *Id.*

<sup>57</sup> Stephan Hobe & Rada Popova, *Space Mining: The Delineation between National and International Jurisdiction*, 63 PROC. INT'L INST. SPACE L. 47, 49–50 (2020).

<sup>58</sup> Chris Pickens, *Deep-Sea Mining Regulations Remain Far From Complete*, PEWTRUSTS.ORG, (Jan. 30, 2024) [perma.cc/XE6Y-ELSA](https://perma.cc/XE6Y-ELSA).

<sup>59</sup> Secretary-General International Seabed Authority, *Speech on The International Seabed Authority and Deep seabed Disputes*, MAX PLANCK INST., (Sep. 2017) [perma.cc/KY32-MPFP](https://perma.cc/KY32-MPFP).

be a dedicated international arbitration court of experts on space mining technology for corporations and states to litigate their disputes.

A framework the Space Mining industry can learn from is Deep-Sea Mining's expert regulatory and dispute resolution body. It helps to have an organization of experts dedicated to the subject because of the complexities of the operations and the externalities that can arise from irresponsible mining. Parties will also be more motivated to litigate such a complex issue if they are sure their arbiters properly understand the situation. Conflict is going to become more likely as resources become scarce, so setting up a court of experts in the field now will help promulgate legitimacy for when the industry is economically feasible.

## II. DISCUSSION OF CURRENT INTERNATIONAL SPACE MINING LAW

The U.N. has dedicated a committee to oversee all space operations, known as the United Nations Committee on the Peaceful Uses of Outer Space (COPOUS).<sup>60</sup> The U.N. General Assembly established COPOUS in 1958.<sup>61</sup> Critically, it has not proposed any treaties since 1979—the largely failed Moon Agreement—and there is no dedicated dispute resolution body.<sup>62</sup> First, the discussion in this section will focus on three main international treaties: The Outer Space Treaty, the Moon Agreement, and the Artemis Accords. The analysis will focus on pertinent parts of each agreement that affect Space Mining Law, who the treaties apply to, and how they work together. Second, this section will analyze domestic law—demonstrated with case studies of the United States and Japan—and how they interact with the international legal regime.

### A. The Outer Space Treaty

The United Nations passed the first piece of international space legislation, “The Outer Space Treaty,” in 1963.<sup>63</sup> The development of Intercontinental Ballistic Missiles (ICBMs) and Russia's launch of the Sputnik satellite spurred the creation of the treaty.<sup>64</sup> The primary purpose of the treaty is to ensure that states

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<sup>60</sup> *Committee on the Peaceful Uses of Outer Space*, U.N., [perma.cc/9Z46-MKMK](https://perma.cc/9Z46-MKMK) (last visited Nov. 16, 2024).

<sup>61</sup> *Id.*

<sup>62</sup> *Space Law Treaties and Principles*, U.N., [perma.cc/Y3VR-3FC6](https://perma.cc/Y3VR-3FC6) (last visited Nov. 16, 2024).

<sup>63</sup> See OUTER SPACE TREATY, *supra* note 12.

<sup>64</sup> *Outer Space Treaty*, CTR. FOR ARMS CONTROL & NON-PROLIFERATION, (Nov. 16, 2022) [perma.cc/EL23-LW5X](https://perma.cc/EL23-LW5X).

still have economic freedom, but prevent overly exploitative activity at the expense of the common good.<sup>65</sup> Despite a lack of enforcement mechanisms, the treaty has been seen as a success because of its widespread adoption and for its provisions being a part of customary international law.<sup>66</sup>

Article 1 states that the “exploration and use of outer space . . . shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.”<sup>67</sup> This section implies that countries should not be able to engage in Space Mining unless they are doing it for the benefit and interest of all.<sup>68</sup> The drafters acknowledge that the scientific and economic development is likely to be substantial, but want to ensure that it is done for the benefit of all, not just the wealthy space-faring nations. The use of “province of all mankind” suggests that the creators of the treaty saw outer space as a territory for all. Some scholars have determined this language to prohibit the commercial exploitation of resources,<sup>69</sup> while others believe that this language is better interpreted as allowing commercial space mining.<sup>70</sup> In support of commercial Space Mining, scholars point to UNCLOS, which states that the seabed is the “common heritage of mankind.”<sup>71</sup> In 1994, the U.N. modified the treaty to allow for “[d]evelopment of resources . . . in accordance with sound commercial principles”, which countries have interpreted to include mining,<sup>72</sup> in an effort to convince major industrialized countries to ratify it.<sup>73</sup> UNCLOS used the language “common heritage of mankind”, and had to be amended to allow for Deepsea mining, implying the “common heritage” language prohibited mining. But, The Outer Space Treaty uses the phrase “province of all mankind”, and did not require the same amending history, suggesting it should not be interpreted to have the same ban on mining

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<sup>65</sup> See OUTER SPACE TREATY, ANNEX, *supra* note 12 (“[b]elieving that the exploration and use of outer space should be carried on for the benefit of all peoples irrespective of the degree of their economic or scientific development”).

<sup>66</sup> See Thomas Cheney, *There’s No Rush: Developing a Legal Framework for Space Resource Activities*, 43 J. SPACE L. 106, 110 (2019).

<sup>67</sup> See OUTER SPACE TREATY, *supra* note 12, art. I.

<sup>68</sup> Gbenga Oduntan, *Who owns space? US Asteroid-Mining Act is Dangerous and Potentially Illegal*, THE CONVERSATION, (Nov. 25, 2015) [perma.cc/EBP2-MSB8](https://perma.cc/EBP2-MSB8).

<sup>69</sup> *Id.*

<sup>70</sup> Frans von der Dunk, *The US Space Launch Competitiveness Act of 2015*, THE JURIST, (Nov. 30, 2015) [perma.cc/X8AH-ABTH](https://perma.cc/X8AH-ABTH).

<sup>71</sup> Convention on the Law of the Sea (UNCLOS), Dec. 10, 1982, 1833 U.N.T.S. 397, Sec. 2, art. 136 [hereinafter UNCLOS].

<sup>72</sup> Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea, Sec. 6(1)(a) (Dec. 10, 1982) [perma.cc/C9XZ-HKDD](https://perma.cc/C9XZ-HKDD).

<sup>73</sup> See Frans von der Dunk, *supra* note 70.

as UNCLOS. Instead, the term “province of all mankind” is better interpreted in tandem with “the benefit and interests of all countries” language. The Outer Space Treaty is meant to prevent over-exploitation of space resources by certain states at the expense of the rest of the world.

Article II states that “[o]uter space . . . is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.”<sup>74</sup> This part of the treaty emphasizes that no state can claim sovereignty over a celestial body.<sup>75</sup> This article does not forbid countries from using celestial bodies’ resources, just that they cannot make claims of sovereignty. If they do not claim sovereignty over the celestial body, they can use it to the limits of the other sections of the treaty.

Finally, Article IX states that “[s]tate [p]arties to the [t]reaty shall pursue studies of outer space . . . to avoid their harmful contamination.”<sup>76</sup> “[C]ontamination” can be interpreted as either prohibiting an *accidental* disruption to the celestial body or that the asteroid should not be changed or disrupted in *any* way. Under a broader interpretation, that an asteroid should not be changed or disrupted in any way, Space Mining would be outlawed under the treaty because it would “contaminate” celestial bodies.<sup>77</sup> However, the better interpretation of this clause is to refer to accidental contamination. A proper analogy is a deepwater oil rig. An oil rig drilling in the ocean is going to kick up sediment and disrupt the seabed. But that is a natural byproduct of the activity; to drill for oil, the seabed will have to be disrupted. Instead, a “contamination” in that context is a leak that spills oil into the ocean. A hypothetical law that banned “contamination” of the ocean would not be understood as banning all drilling; instead, it would be punishing accidents that happen. This clause is better understood to try and address accidents and collateral consequences, not to ban economic activity in total. A broader interpretation would potentially limit the ability of scientific exploration, if any activity on celestial bodies count, that would sweep in scientific uses. This is antithetical to what the treaty intends to do.

The Outer Space Treaty is considered a success for international Space Law. Notably, 113 countries, including all space-faring countries, have ratified, and a further twenty-three have signed it.<sup>78</sup> As an example of its influence on

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<sup>74</sup> See OUTER SPACE TREATY, *supra* note 12, art. II,

<sup>75</sup> Alexander Lewis, *A Bundle of Sticks in Zero G: Non-State Actor Mining Rights for Celestial Bodies*, 25 SW. J. INT’L L. 393, 399 (2019) (finding that this article of The Outer Space Treaty emphasized only state action to assert sovereignty).

<sup>76</sup> See OUTER SPACE TREATY, *supra* note 12, art. IX.

<sup>77</sup> See Oduntan, *supra* note 68.

<sup>78</sup> Jack Wright Nelson, *Is International Space Law Interactional?*, 62 COLUM. J. TRANSNAT’L L. 331, 333 (2024).

domestic law, the U.S. Commercial Space Launch Competitiveness Act (“USCSLCA”) expressly noted that its domestic law allowing for space mining would have to be done in “accordance with the international obligations of the United States.”<sup>79</sup> These obligations expressly include The Outer Space Treaty, which the U.S. has signed.<sup>80</sup>

## B. The Moon Agreement

The second international agreement of relevance is the Moon Agreement. The Moon Agreement was meant to be an elaboration of The Outer Space Treaty.<sup>81</sup> Unlike The Outer Space Treaty, the Moon Agreement is less widely accepted. No space-faring nations signed on.<sup>82</sup> Even though it is called “the Moon Agreement,” Article 1 states that the treaty applies to other celestial bodies in the solar system.<sup>83</sup> Limited ratification is the biggest barrier to the Moon Agreement’s effectiveness. States, particularly major space-faring nations Russia, China, and the U.S.,<sup>84</sup> saw the treaty as too restrictive of commercial activities, compared to The Outer Space Treaty, which still allowed considerable state autonomy over economic development.<sup>85</sup>

Article 11 is the most problematic portion of the treaty for commercial space mining—it puts the entire legality of the practice in doubt. Previously, The Outer Space Treaty regarded asteroids as “the province of all mankind.”<sup>86</sup> This language, interpreted in context, suggests that celestial bodies can be used for resource extraction.<sup>87</sup> In comparison, the Moon Agreement states in Article 11, Section 1, that “[t]he moon and its natural resources are the *common heritage of mankind*.”<sup>88</sup> This phrase was used before. UNCLOS originally drafted the ocean floor to be the

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<sup>79</sup> See USCSLCA, *supra* note 19.

<sup>80</sup> 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).

<sup>81</sup> See THE MOON AGREEMENT, *supra* note 13.

<sup>82</sup> Katharina Buchholz, *The Countries that Signed the Moon Treaty*, STATISTA, (Aug. 23, 2023) [perma.cc/TZN4-YC36](https://www.statista.com/chart/1234567/the-countries-that-signed-the-moon-treaty).

<sup>83</sup> See THE MOON AGREEMENT, art. 1, *supra* note 13.

<sup>84</sup> Walker A. Smith, *Using the Artemis Accords to Build Customary International Law: A Vision for A U.S.-Centric Good Governance Regime in Outer Space*, 86 J. AIR L. & COM. 661, 663 (2021).

<sup>85</sup> See Henson *supra* note 17.

<sup>86</sup> See OUTER SPACE TREATY, *supra* note 12, art. I,

<sup>87</sup> See Prue Taylor, *Common Heritage of Mankind Principle*, in THE ENCYCLOPEDIA OF SUSTAINABILITY, VOL. 3: THE LAW AND POLITICS OF SUSTAINABILITY, 64–69 (Klaus Bosselmann et al. eds., 2011) (“[C]ommon heritage of mankind’ is an ethical concept [that] . . . establishes that some localities belong to all humanity and that their resources are available for everyone’s use and benefit.”).

<sup>88</sup> See THE MOON AGREEMENT, *supra* note 13, art. 11.

“common heritage of mankind,” but major industrialized countries saw it as a prohibition on commercial mining practices and refused to ratify the treaty until it was modified.<sup>89</sup> This interpretation is furthered by Article 11, Section 3, which states “[n]either the surface or the subsurface of the moon, or any part thereof or natural resources in place, shall become the property of any state, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person.”<sup>90</sup> This clause expressly excludes natural resources from becoming “property” and has been interpreted as a ban on space mining.<sup>91</sup> It also expands on the language from The Outer Space Treaty by including non-state actors, which extends beyond the sovereignty concern of The Outer Space Treaty, and applies to resource extraction broadly. Even if it did allow space mining, countries had considerable concern with Article 11 (7)(d) that required “[a]n equitable sharing by all [s]tates [p]arties in the benefits derived from those resources . . .”<sup>92</sup> Redistribution created fear, particularly from the U.S., that the incentive for space exploration would be chilled.

One important development with the Moon Agreement is its understanding of potential future conflicts related to space mining. In the Annex, it notes that part of the reason for signing the agreement is the “desir[e] to prevent the moon from becoming an area of international conflict,” and ratifying the agreement “bearing in mind the benefits which may be derived from the exploitation of the natural resources of the moon and other celestial bodies.”<sup>93</sup> The international community had an understanding of the potential conflicts that space mining and other celestial activities may create. Because of its lack of ratification, the Moon Agreement is not a concern for a new space mining framework. New regulations should learn from the Moon Agreement’s failure and ensure that it is not overstepping states’ economic desires lest it risks alienating possible signatories. Instead of banning mining, new regulations should weigh the economic and environmental interests to protect the planet and provide proper incentives for parties to join.

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<sup>89</sup> See von der Dunk, *supra* note 70.

<sup>90</sup> See THE MOON AGREEMENT, *supra* note 13, art. 11, sec. 3.

<sup>91</sup> Michael Listner, *The Moon Treaty: failed international law or waiting in the shadows?*, SPACE REV., (Oct. 24, 2011) [perma.cc/4QPF-5SYT](http://perma.cc/4QPF-5SYT).

<sup>92</sup> See THE MOON AGREEMENT, *supra* note 13, art. 11(7)(d).

<sup>93</sup> See *id.*, annex.

### C. The Artemis Accords

The final international agreement is the Artemis Accord, a non-binding set of principles established by NASA in coordination with the U.S. Department of State and seven other founding members, signed on October 13, 2020.<sup>94</sup> The Accords are meant to reinforce current international law with principles to govern civil space exploration and use in the twenty-first century.<sup>95</sup> The agreement has largely been seen as a success, growing from eight members at signing, to fifty-three members as of January 2025.<sup>96</sup> Even though it is not binding, the Artemis Accords encourage general cooperation and sets forward customary norms for countries to follow.

In contrast to the Moon Agreement, the Artemis Accords encourage space mining. Importantly, the agreement notes that all space mining should be done “in a manner that complies with The Outer Space Treaty.”<sup>97</sup> This implies an interpretation that The Outer Space Treaty allows space mining in the first place. The focus of space mining in the Artemis Accords is mostly limited to Section 10, which outlines four principles for countries to follow.<sup>98</sup> First, the utilization of space resources can benefit humankind by providing critical support for safe and sustainable operations.<sup>99</sup> Second, the extraction and utilization of space resources shall be executed in a manner that complies with The Outer Space Treaty, in support of safe and sustainable space activities, and in a way that does not constitute national appropriation under Article II of The Outer Space Treaty.<sup>100</sup> Third, the signatories commit to informing the Secretary-General of the U.N., as well as the public and international community, of space resource extraction activities under The Outer Space Treaty.<sup>101</sup> Fourth, the signatories intend to use their experience under the Accords to further develop international practices and rules applicable to the extraction of space resources.<sup>102</sup>

Even though non-binding, the Artemis Accords have been seen as a success because of their proliferation and the general nature of cooperation.<sup>103</sup> After the

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<sup>94</sup> *Overview, Artemis Accords*, U.S. DEP’T STATE, [hereinafter DOS Artemis Accords] [perma.cc/XFY3-TJLZ](https://perma.cc/XFY3-TJLZ) (last visited Nov. 16, 2024).

<sup>95</sup> *Principles for a Safe, Peaceful, and Prosperous Future*, NASA, [perma.cc/YR27-XWAK](https://perma.cc/YR27-XWAK) (last visited Oct. 11, 2024).

<sup>96</sup> *Artemis Accords*, U.S. DEP’T STATE, [perma.cc/2HEE-E2F2](https://perma.cc/2HEE-E2F2) (last visited Nov. 16, 2024).

<sup>97</sup> *Id.*

<sup>98</sup> ARTEMIS ACCORDS, *supra* note 14, § 10, art. 1.

<sup>99</sup> *Id.* art. 1–4.

<sup>100</sup> *Id.*

<sup>101</sup> *Id.*

<sup>102</sup> *Id.*

<sup>103</sup> *Overview, Artemis Accords*, *supra* note 94.

failure of the Moon Agreement, it is a step in the right direction to see most space-faring nations agree on a new set of guidelines to oversee their behavior. However, it remains to be seen whether or not states would have the same enthusiasm for the agreement if it were binding, with enforceable penalties.

#### D. Current Domestic Law Examples

The U.N. has encouraged countries to create domestic laws that comply with international norms and comply with international treaties. For a comparison of domestic law, this analysis will focus on the leader in space law, the U.S., and a more recent adopter, Japan.

##### 1. U.S.

The most prominent piece of legislation adopted by the U.S. is the U.S. Commercial Space Launch Competitiveness Act (“USCSLCA”). Enacted in 2015, the law is intended to help create an environment for a commercial space industry by “encouraging private sector investment and creating more stable and predictable regulatory conditions.”<sup>104</sup> The most important section is “Chapter 513—Space Resource Commercial Exploration and Utilization.” The law instructs the President to “facilitate commercial exploration for and commercial recovery of space resources by United States citizens.”<sup>105</sup> Instead of just allowing space mining, this law encourages the President to help facilitate the development of the industry. The law continues that the President shall “discourage government barriers” to the industry and “promote the right of United States citizens to engage in commercial exploration for and commercial recovery of space resources free from harmful interference.”<sup>106</sup> Through this law, the U.S. implied that it interprets The Outer Space Treaty to allow space mining; it adopted the law with the understanding that it is “in accordance with the international obligations of the United States.”<sup>107</sup> Five years later, the U.S. would be one of the founding members of the Artemis Accord and affirm its space mining posture.<sup>108</sup> This law was passed in the shadow of The Outer Space Treaty, but it ignores the Moon Agreement, which was not ratified by the U.S.

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<sup>104</sup> See USCSLCA, *supra* note 19.

<sup>105</sup> *Id.* ch. 513.

<sup>106</sup> *Id.*

<sup>107</sup> *Id.*

<sup>108</sup> See generally, ARTEMIS ACCORDS, *supra* note 14.

## 2. Japan

Japan, like the U.S., is a member of The Outer Space Treaty,<sup>109</sup> has rejected the Moon Agreement,<sup>110</sup> and was one of the eight founders of the Artemis Accords.<sup>111</sup> Japan passed its first domestic space law in 2008,<sup>112</sup> but its first law specifically governing the extraction of “Space Resources” was passed in 2021, known as the “Space Resources Act.”<sup>113</sup> The purpose of the Act is to ensure the accurate and smooth implementation of conventions concerning the development and use of outer space.<sup>114</sup> All entities that want to engage in these activities must apply for a permit with a “business activity plan” including their purpose, period of activity, location, methods, and any other matters related to the exploration they want to engage in.<sup>115</sup> The Prime Minister approves or denies the permit with consultation from the Minister of Economy, Trade, and Industry.<sup>116</sup>

## 3. The two regimes compared

The most notable difference between Japan and the U.S. is that Japan requires actors to apply for the permit ahead of time. In comparison, the U.S. removes the government from the process and allows private actors to mine as long as they comply with domestic and international law.<sup>117</sup> In Japan, a private entity cannot mine in space without prior approval, regardless of its compliance with international law. Based on the success of the Hayabusa mission in gathering celestial materials, even at a high cost, it is apparent that Japan’s law still provides enough incentives to private parties to encourage discovery and technological advancement. The Hayabusa mission was a private party carrying out a space exploration mission for scientific purposes with the approval of the Japanese government. This provides evidence that potential space mining regulation can require upfront approval before sanctioning the activity, and that is not too large a barrier to stifle industry activity. Japan has been commended for its approach, providing a greater regulatory barrier against potentially negative environmental consequences.

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<sup>109</sup> See Kate Howells, *What is the Outer Space Treaty?*, THE PLANETARY SOCIETY, (May 14, 2024) <https://perma.cc/E7NK-V9MV>.

<sup>110</sup> See Katharina Buchholz, *supra* note 82.

<sup>111</sup> See DOS Artemis Accords, *supra* note 94.

<sup>112</sup> 宇宙基本法 Uchū Kihon Hou [Basic Space Act], Act No.43 of 2008 (Japan).

<sup>113</sup> See *Japan: Space Resources Act Enacted*, LIBR. CONG., [perma.cc/59U5-HKR2](https://perma.cc/59U5-HKR2) (last visited Nov. 16, 2024).

<sup>114</sup> See JAPAN SPACE MINING LAW, *supra* note 21.

<sup>115</sup> *Id.* art. 3(i–iv).

<sup>116</sup> *Id.* art. 3, § 3.

<sup>117</sup> See USCSLCA, *supra* note 19, ch. 513.

In contrast to Japan, scholars have criticized the U.S.'s approach, believing it warped the meaning of The Outer Space Treaty for its own gain.<sup>118</sup> When The Outer Space Treaty was first passed, these scholars posit, the point of the treaty was to create harmony and advance scientific goals in space.<sup>119</sup> With USCSLCA, the U.S. established that The Outer Space Treaty allows for the exploitation of mineral resources in space despite the environmental risks that it poses.<sup>120</sup> To some scholars, this law is driven by greed.<sup>121</sup>

### III. DISCUSSION OF CURRENT INTERNATIONAL DEEP-SEA MINING LAW

This Section focuses on deep-sea mining, which the U.N. Convention on the Law of the Seas (UNCLOS) has entrusted to the International Seabed Authority (ISA). Deep-sea mining is the extraction of materials, including valuable minerals, from the sea floor. The process was once seen as impossible, as space mining is regarded now, but it is now being done by countries across the world. Deep-sea mining is an appropriate analogue to space mining because the international seabed has a similar designation for commercial activities as outer space. UNCLOS states that all deep-sea mining activities should be done for the “benefit of mankind as a whole”<sup>122</sup> compared to The Outer Space Treaty, which declares that it should be done “for the benefit . . . of all countries . . . [and Outer Space is considered as] the province of all mankind.”<sup>123</sup> Although UNCLOS contains the same language as the Moon Agreement in that the seabed is the “common heritage of mankind,” UNCLOS was intentionally amended to allow for commercial mining.<sup>124</sup> The ISA framework is a well-designed regulatory body for space mining to follow because it appropriately balances the consideration of externalities with economic incentives. Parties have to apply for approval from the ISA for deep-sea mining, but funding of the ISA itself comes from the approval of successful contracts.<sup>125</sup> This provides adequate incentive to approve contracts as they come.

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<sup>118</sup> See Oduntan, *supra* note 68.

<sup>119</sup> See UNCLOS, *supra* note 71, preamble.

<sup>120</sup> See Oduntan, *supra* note 68.

<sup>121</sup> *Id.*

<sup>122</sup> See UNCLOS, *supra* note 71, art. 140, § 1.

<sup>123</sup> See OUTER SPACE TREATY, *supra* note 12, art. 1.

<sup>124</sup> See von der Dunk, *supra* note 70.

<sup>125</sup> See UNCLOS, *supra* note 71, art. 13, § 6(c)(2).

The international community has shown itself to be open to deep-sea mining by states and private entities. There are currently twenty-two different subcontractors, spanning thirty total active agreements, and 1.5 million kilometers of international seabed that the ISA has contracted for.<sup>126</sup> In 2021, an international intergovernmental organization called the International Union for the Conservation of Nature (IUCN) adopted Resolution 122 that called for a moratorium on deep-sea mining.<sup>127</sup> The resolution explained why deep-sea mining should be prohibited, but it was non-binding, and the ISA rejected the moratorium.<sup>128</sup> Despite the proposed moratorium, countries have continued prospecting new locations and testing out new deep-sea mining techniques.<sup>129</sup>

#### A. U.N. Convention on the Law of the Sea (UNCLOS)

The U.N. Convention on the Law of the Sea (UNCLOS) developed as the preeminent international legal treaty on the oceans, including the issue of deep-sea mining.<sup>130</sup> The treaty has been ratified by 157 countries with an additional thirteen signatories.<sup>131</sup> The treaty is meant to handle a wide variety of issues concerning the high seas and territorial and coastal areas, including ownership, resource distribution, and passage rights.<sup>132</sup> UNCLOS is highly influential because of its widespread ratification and its effects on both international and domestic laws of the sea.<sup>133</sup> For instance, the U.S. did not ratify the treaty because of its perceived limitation on resource extraction, but its norms percolate into domestic U.S. maritime law.<sup>134</sup> UNCLOS established the International Seabed Authority (ISA) and the International Tribunal for the Law of the Sea (ITLOS) to monitor activities and help resolve disputes.<sup>135</sup> Under UNCLOS, exploration for and of seabed minerals can only be carried out under a contract with the ISA, and the

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<sup>126</sup> *Exploration Contracts*, INT'L SEABED AUTH., [perma.cc/9TK6-PS6S](https://perma.cc/9TK6-PS6S) (last visited Nov. 25, 2025).

<sup>127</sup> *Issues Brief: Deep-Sea Mining*, INT'L UNION CONSERVATION NATURE, <https://perma.cc/GFU7-VRD9> (last visited Nov. 25, 2025).

<sup>128</sup> *Id.*

<sup>129</sup> Jan Dusik, *Norway Undermines the High Seas Treaty by Rushing Deep-Sea Mining Authorization*, ARCTIC WWF, (June 28, 2024) [perma.cc/D46W-DU2R](https://perma.cc/D46W-DU2R).

<sup>130</sup> See UNCLOS, *supra* note 71.

<sup>131</sup> *United Nations Depository Law of the Sea*, U.N., (Nov. 17, 2024) [perma.cc/SQ7S-RGC9](https://perma.cc/SQ7S-RGC9).

<sup>132</sup> 30 A.L.R. Fed. 3d art. 7 (originally published in 2018).

<sup>133</sup> *Id.*

<sup>134</sup> *Id.*

<sup>135</sup> See UNCLOS, *supra* note 71, annex 1, resol. 1.

rules, regulations, and procedures that they outline.<sup>136</sup> UNCLOS previously declared the ocean floor as the “common heritage of mankind” and that its exploration and exploitation should be carried out for the “benefit of mankind as a whole.”<sup>137</sup> But this language was changed because major industrialized countries did not want to share their profits.<sup>138</sup> UNCLOS established that disputes are meant to be handled by ITLOS, which in turn created the Seabed Disputes Chamber (SDC) specifically for seabed disputes.<sup>139</sup>

## B. The International Seabed Authority

The ISA controls deep-sea mining rights. States have to sponsor a non-state entity that, once approved, can enter into a contract with ISA for the right to prospect, explore, and exploit resources in the deep sea.<sup>140</sup> The authority is meant to “encourage prospecting” but can only approve companies when they have received a “satisfactory written undertaking” that the prospector will comply with the rules of this convention and the authority's rules and regulations.<sup>141</sup> Article 3 outlines that parties and entities apply to the authority for “approval of plans of work for activities in the area,” which means they require the ISA’s permission to engage in the practice.<sup>142</sup> For selection, the ISA issues authority for all such applications without “exceeding the production limitation or contravening obligations of the authority.”<sup>143</sup> This limitation instructs the ISA to approve as many as possible, but with an environmental ceiling on production. Importantly, the ISA is supported by mining operations by receiving “financial contributions”.<sup>144</sup> This creates an incentive for the ISA to approve contracts and ensures they are properly taking into account the economic incentive of parties engaging in deep-sea mining operations. The ISA is permitted to levy penalties for violations of the contract, with “monetary penalties proportionate to the seriousness of the violation,” given by the ISA.<sup>145</sup>

<sup>136</sup> Michael Lodge, *The International Seabed Authority and Deep Seabed Mining*, U.N., [perma.cc/5Q9N-3TNR](https://perma.cc/5Q9N-3TNR) (last visited Oct. 12, 2024).

<sup>137</sup> See UNCLOS, *supra* note 71, preamble.

<sup>138</sup> Will Schrepferman, *Hypocri-sea: The United States’ Failure to Join the UN Convention on the Law of the Sea*, HARV. INT’L REV., (Oct. 31, 2019) [perma.cc/JLG8-Y2E2](https://perma.cc/JLG8-Y2E2).

<sup>139</sup> See UNCLOS, *supra* note 71, art. 187.

<sup>140</sup> *Id.* annex III, art. 2, § 1(b).

<sup>141</sup> *Id.*

<sup>142</sup> *Id.* art. 3, § 1.

<sup>143</sup> *Id.* § 7.

<sup>144</sup> *Id.* art. 13, cl. 4.

<sup>145</sup> *Id.* art. 18, § 2.

The ISA has attempted to strike a balance between ensuring private actors and governments are properly incentivized and compensated for their investment, while keeping the seabed protected. The ISA has been seen as a success; it has contributed to the U.N.'s long-term sustainable development goals, particularly helping to set rules, regulations, and procedures that protect the marine environment while helping increase economic development.<sup>146</sup> Olivier Guvonyarch, permanent representative of France to the ISA, has commended the organization for “implement[ing] an obligation of generosity for the benefit of all, especially less well-off countries.”<sup>147</sup>

### C. The Seabed Disputes Chamber and Dispute Resolution

Any dispute under UNCLOS is governed by two general principles. First, the principle of peaceful settlement of international disputes mandates a peaceful resolution.<sup>148</sup> Second, the principle of free choice means it is the right of any State Parties to agree at any time to settle a dispute between them.<sup>149</sup> These principles are standard. Parties must resolve their disputes peacefully and are free to turn to alternative, informal settlement if they choose to. But, if the parties cannot agree, UNCLOS established the SDC to oversee and mediate disputes between parties, specifically over seabed mining.<sup>150</sup>

The current deep-sea mining framework calls for adjudication to go through the SDC if parties cannot agree.<sup>151</sup> However, there has yet to be a dispute between two parties that has gone through the SDC framework, and SDC dialogue has been limited to an advisory opinion.<sup>152</sup> Parties can go to the deep-sea mining governing body for an answer, though, when they need clarification on international law. In comparison, lawsuits that have taken place outside the settlement body have proven to be ineffective for a holistic consideration of

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<sup>146</sup> See generally, *The Contribution of the International Seabed Authority to the Achievement of the 2030 Agenda for Sustainable Development*, INT'L SEABED AUTH., (Oct. 2021) [perma.cc/5NKF-A79E](https://perma.cc/5NKF-A79E).

<sup>147</sup> Press Release, The Secretariat of the International Seabed Authority, *The Contribution of the International Seabed Authority to the Achievement of the 2030 Agenda for Sustainable Development* (Dec. 2, 2021) [perma.cc/ZH6V-4LDR](https://perma.cc/ZH6V-4LDR).

<sup>148</sup> José Enrique Pérez Montes, *Commercial Arbitration of Deep Seabed Mining Disputes: A Survey on Its Legal Contours*, 93 REV. JUR. U.P.R. 361, 374 (2024).

<sup>149</sup> *Id.*

<sup>150</sup> See UNCLOS, *supra* note 71, art. 188.

<sup>151</sup> *Id.* § 5, art. 11.

<sup>152</sup> *Responsibilities and obligations of States Sponsoring Persons and Entities with respect to activities in the Area, Request for Advisory Opinion Submitted to the Seabed Disputes Chamber*, Feb. 1, 2011, ITLOS Rep. 2011, [perma.cc/82ZY-H4SP](https://perma.cc/82ZY-H4SP).

international law and frequently prioritize the interests of corporations.<sup>153</sup> This runs counter to the goal that the seabed be used “for the benefit of all mankind.”<sup>154</sup> For example, Odyssey Marine Exploration agreed with the government of Mexico in 2012 to mine the Mexican seabed for phosphate, a key ingredient in commercial fertilizers.<sup>155</sup> This project would include 50 years of dredging that had the potential to cripple marine life and the local fishing economy.<sup>156</sup> In 2018, the Mexican government reversed course and rejected the project, and was then sued in an Investor-State Dispute Settlement court that ruled in the company’s favor.<sup>157</sup> These settlement bodies have been criticized for “consistently interpret[ing] more expansively against the host countries of investment in favour of investors.”<sup>158</sup>

#### D. Example Domestic Countries’ Deep-Sea Mining Law

Like space mining regulations, each country has treated deep-sea mining differently. The U.S. has not ratified the UNCLOS and has remained largely outside the industry of deep-sea mining.<sup>159</sup> Measures have been proposed by Congress to outlaw deep-sea mining until the ISA adopts a more pro-environment regulatory framework.<sup>160</sup> However, the American government and corporations have doubted the economic feasibility of the practice and seem comfortable standing pat as countries around them rush to break into the market.<sup>161</sup> In comparison, Japan treats deep-sea mining similarly to space mining. The statute that regulates all mining activities was passed in 1950 as “The Mining Act.”<sup>162</sup> The Act detailed that mining of mineral resources should contribute to the improvement of public welfare and, therefore, should be mined reasonably.<sup>163</sup>

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<sup>153</sup> Paul Keenlyside, *Corporate Bias in Investor-State Dispute Settlement Threatens Environmental Protection*, SIERRA CLUB, (Oct. 17, 2016) [perma.cc/D57Z-5NTR](https://perma.cc/D57Z-5NTR) (demonstrating the problems of corporate bias in Investor-Settlement disputes decided by international arbitration tribunals).

<sup>154</sup> See UNCLOS, *supra* note 71, art. 140.

<sup>155</sup> Laura Paddison, *How a US mining firm sued Mexico for billions – for trying to protect its own seabed*, THE GUARDIAN, (Jan. 31, 2024) [perma.cc/ZZ9F-LPKF](https://perma.cc/ZZ9F-LPKF).

<sup>156</sup> *Id.*

<sup>157</sup> *Id.*

<sup>158</sup> *Id.*

<sup>159</sup> Bill Whitaker, *Why the U.S. hasn't joined the race for deep sea mining in international waters*, CBS NEWS, (June 23, 2024) [perma.cc/ZLA7-TSXZ](https://perma.cc/ZLA7-TSXZ).

<sup>160</sup> *Case Introduces Measures To Halt Deep-Seabed Mining Until Full Consequences Understood And Protective Regulatory Regimes Established*, CONGRESSMAN ED CASE, (July 11, 2023) [perma.cc/3S5Y-BGQJ](https://perma.cc/3S5Y-BGQJ).

<sup>161</sup> See Whitaker, *supra* note 159.

<sup>162</sup> The Mining Act, Act No. 289 of 1950, as amended, art. 1, (Japan).

<sup>163</sup> *Id.*

Notably, the Act does not guarantee the rights of the landowner.<sup>164</sup> The principles for deep-sea mining, in particular, are similar to space mining; people who wish to engage in the process must obtain approval from the Ministry of Economy to mine on the ocean floor.<sup>165</sup>

#### IV. A HYPOTHETICAL SPACE MINING DISPUTE

Space mining has yet to become a widespread practice, so there is no history of any disputes over mining rights or acquired resources. But, if there were, the world would be ill-prepared to come up with a solution for the dispute. To demonstrate these problems, this comment will use a hypothetical, with Japan and the U.S. as the focus because they abide by the same international agreements and have different domestic regimes. Because space mining is not yet technologically feasible, a hypothetical is the best way to show why the world would be wholly unprepared for any disagreement. The key players in this scenario are the U.S. and Japanese governments and the corporations that the two governments are hoping can harness the potential of a resource-rich asteroid.

##### A. Space Mining in the U.S.

For a corporation in the U.S. to successfully space mine, it does not have to contend with a large amount of domestic law. The practice only has to be done following the USCSLCA, which mandates that all space mining activities be done in accordance with the U.S.'s "International obligations."<sup>166</sup> This means that activities must comply with The Outer Space Treaty, can ignore the Moon Agreement, and optionally abide by the Artemis Accords.

This hypothetical scenario will focus on a mission that is planned between SpaceX, a private Space Exploration company started by billionaire Elon Musk, and NASA.<sup>167</sup> Currently, the two bodies have a plan for a 6-year mission to target the metal-rich asteroid known as "Psyche," where the satellite being launched will orbit the asteroid "to take pictures, map the surface, and collect data to determine Psyche's composition."<sup>168</sup> However, in this scenario, they instead turn their

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<sup>164</sup> See *id.* art. 25(1).

<sup>165</sup> The Act on Interim Measures for Deep Seabed Mining ["DSM Act"], Act No. 64 of 1982, as amended, (Japan).

<sup>166</sup> See USCSLCA, *supra* note 19.

<sup>167</sup> *The Colossal Untapped Value of Asteroids*, STATISTA, (Oct. 12, 2023) [perma.cc/76AD-VGW2](https://www.statista.com/chart/76AD-VGW2/) [hereinafter "The Colossal Value"].

<sup>168</sup> *Id.*

attention to the asteroid “Davida,” located in the asteroid belt between Mars and Jupiter.<sup>169</sup> Davida is considered the most valuable asteroid in the belt, valued at twenty-seven quintillion (26,990,000,000,000,000) U.S. dollars.<sup>170</sup> This valuation is likely inflated, for if twenty-seven quintillion dollars’ worth of resources are brought to Earth, there would be a surplus, and the resources would no longer be nearly as valuable. But, this asteroid still contains an abundance of freshwater, iron, cobalt, nitrogen, ammonia, and hydrogen, making it extremely valuable for whichever entity can harvest its riches.<sup>171</sup>

Hypothetically, SpaceX and NASA can adequately mine resources from celestial bodies. They have engaged in a few test missions and can scalp rocks from asteroids, bring them back to Earth, and extract the minerals or other resources from them. Even though the economic return may still be limited at this point, the partnership set its sights on a target that will provide the payoff it desires: the resource-rich Davida.

## B. Space Mining in Japan

Across the Pacific Ocean, Japan is having success in space mining. Building off the success of the Hayabusa mission—the first Space mission to bring material back from a celestial body—Japan has continued to invest in the industry. In Japan, companies need a permit for such activities, but with the country's previous success in the endeavor and the desire to find new outlets for natural resources, parties with an appropriate business plan have found the government accommodating of their ideas. In Japan, the leading company is “Ispace,” which is already licensed by the government to engage in Space exploration.<sup>172</sup> Ispace has created a contract with a London-based robotics company to create a robot for future space mining efforts on the moon.<sup>173</sup>

In this hypothetical, Ispace continues to succeed in the field, but, similar to the United States operation, it has yet to find the economic payoff with its current missions. Ispace turns its attention to the Davida asteroid because of its considerable value. This creates a problem between the two parties because both states (in collaboration with private companies) are trying to mine the same celestial body. Importantly, neither party can claim sovereignty over the asteroid, but both will want access to its resources.

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<sup>169</sup> *Id.*

<sup>170</sup> *Id.*

<sup>171</sup> *Id.*

<sup>172</sup> Alexey Ilin, *Space Mining, Japan’s ispace, and the New Era of Space Law*, MOD. DIPL., (Apr. 3, 2023) [perma.cc/N5C6-NN5D](https://perma.cc/N5C6-NN5D).

<sup>173</sup> *Ispace and Asteroid Mining Corporation Agree to Pursue Future Mission to the Moon*, ISPACE, (Oct. 9, 2024) [perma.cc/HM7F-7AMG](https://perma.cc/HM7F-7AMG).

### C. The Dispute

Both operations may be compatible on the Asteroid. But there are unanswered questions about the viability of more than one mining operation on the same asteroid. One particular area could be more valuable than the rest, creating a race to claim that area. A first-in-time rule would not provide adequate certainty to the parties when the industry requires significant up-front investment. Making it winner-take-all could discourage either party from getting involved because of the uncertainty of any economic payoff.

The first wrinkle is the time it can take the spacecraft to reach the asteroid from Earth. Mission duration varies, taking anywhere from eighty-one days to over three years.<sup>174</sup> A first-in-time rule would incentivize faster spacecraft but also rush the process. Countries will be incentivized to cut corners on safety to try and make a faster spacecraft than their counterparts. This could lead to more failed missions or reckless mining habits, creating more dangerous space debris for future missions to contend with. This would run counter to the principle that these missions should be carried out “for the benefit of mankind as a whole.”<sup>175</sup> To ensure this clause is met, a review of the plans, before operation, is necessary from a non-biased third party. The rule would also run in line with Japan’s legal framework. Japan does not consider ownership of land with rights to use it; instead, the fruits of mining are meant to be used for the benefit of society as a whole.<sup>176</sup> It uses a licensing system and review from the government to ensure that companies engage in proper mining techniques and that benefits are properly distributed to the public at large.<sup>177</sup>

In this hypothetical, Japan could give a company a license to prospect and invest heavily into the affair, only to find upon launch that an American space mining ship reached the asteroid first, regardless of whether it might be the most efficient or best company for the job. They may even launch first, but their spacecraft takes longer to arrive than an American ship launched later. This would be a massive waste of resources for the Japanese company. Space travel is difficult and incredibly expensive, the monetary and time investment for space mining necessitates that companies launching these operations need certainty that they will have the opportunity to mine. There is already enough economic incentive in

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<sup>174</sup> Matt Williams, *How Long Does it Take to get to the Asteroid Belt?*, UNIVERSAL-SCI, (Aug. 10, 2016) [perma.cc/C65R-XEQW](http://perma.cc/C65R-XEQW).

<sup>175</sup> See UNCLOS, *supra* note **Error! Bookmark not defined.**, preamble.

<sup>176</sup> See The Mining Act, *supra* note 162.

<sup>177</sup> *Id.*

the amount of resources available that an incentive to be first-in-time is not needed.

#### D. Finding a Solution

So, where does that leave these two entities? They have both invested hundreds of millions of dollars in canvassing the asteroid, building, and flying spaceships to mine on Davida, only to find that the most valuable area only provides space for one operation. Who gets access? Who bears the sunk cost? A first-in-time rule creates a massive waste of resources and animosity between states with conflicting legal schemes.

A permanent administrative body, similar to the ISA, would help solve this problem on the front end. With a similar framework to the ISA, these companies can both submit their business plans for approval, with priority review given to whichever country submits its plan first. If the U.S. or Japan files its business plan first, it will get the first review and approval of its plan. However, the administrative body can exercise significant discretion in how its reviews later permits. If they find that the second plan is further along or more efficient, they can supersede an initial permit. This is to prevent gamesmanship from a company planting its flag in the ground on a certain valuable asteroid by applying for a permit early, before they have a detailed plan in place. SpaceX and Ispace can each file their business plans with the administrative body and the first to file gets the first review of their plan. However, there will still be an incentive to create the most robust plan possible or risk being superseded by a later mission. This provides adequate incentive for parties even after their business plan has been approved and a backstop in case the administrator is incorrect with its first determination.

If one party ignores another's prospective mining rights and undercuts their contract to mine on a celestial body, there is no adequate redress in the current treaties. This is where it would be critical to have a specialized arbitration panel to hear the dispute. In this hypothetical, Japan could point to its deliberate, methodical process and first approval, which gives it mining rights over the celestial body, and the U.S. could provide counterevidence that they were better prepared to launch the mission because they arrived first and should be properly rewarded for their successful investment. However, it is much easier to have them both apply for permits and have the administrative body rule on who is better suited to receive the permit. If, after the fact, one believes they are better prepared for the mission, they can appeal to the arbitration panel.

A panel of specialized space experts is essential because they will understand the investment and work that went into the project, so they can properly determine who had the better plans and deserves mining rights over the celestial

area. Similar to the scheme in deep-sea mining, the parties are encouraged to settle outside of this framework, but it is here that the two parties are unable to agree on a solution.<sup>178</sup> The best thing that a regulatory framework provides the involved parties is certainty with decisions. Instead of wasting hundreds of millions of dollars on space flights that are a zero-sum game, these parties can turn to a neutral finder-of-fact to review their dispute, and the loser can apply for a new contract to prospectively mine another celestial body. This is the most efficient solution for a field that relies on significant advance investment; leaving it up to after-the-fact disputes will waste resources.

## V. APPLYING DEEP-SEA MINING TO SPACE MINING

The proposed solution for the International Space Mining framework is first to create a permanent administrative body modeled after the ISA to give out contracts for states and private entities to mine legally in space, and second to establish a specialized technical space mining court to handle these disputes. Countries will be incentivized to sign on to this new agreement because, even though they may not want to limit their operations, they will want limits on their adversaries. A regulatory body provides a step of monitoring that space-faring nations will desire over other parties.

This would be enforced by a new, binding treaty that builds off the Artemis Accords. The Artemis Accords have garnered support, but to truly give it teeth, parties have to consent to being bound by a similar treaty. The two methods of enforcement would be naming and shaming parties that break the treaty and an agreement to impose sanctions on countries that break the treaty. Countries are incentivized to agree because they will want to ensure their adversaries are regulated, even if they would prefer not to be regulated themselves. Then, after agreeing, there would be a norm to follow the treaty. Any party would be publicly criticized, but more importantly, it could threaten other interests like trade or defense operations if they are sanctioned by other countries in the treaty. The Paris Accords are an example of naming and shaming being an effective manner to keep most countries in check, but the U.S. still felt emboldened to leave when it felt it was not in its interest.<sup>179</sup> Therefore, sanctions are needed alongside this custom to ensure the treaty is followed.

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<sup>178</sup> See UNCLOS, *supra* note 71, art. 188.

<sup>179</sup> Statement by President Donald Trump on the Paris Climate Accords, NAT'L ARCHIVES, (June 1, 2017) <https://perma.cc/AG5E-UWRT>.

## A. A Permanent Administrative Body to Regulate Space Mining

The first proposal is to create a permanent administrative body to monitor space mining like UNCLOS created with the ISA. The main feature to bring from the ISA is the requirement that all contracts have to be approved by the ISA before entities can deep-sea mine. This ensures that deep-sea mining is being done in a manner where states are staying out of each other's way and are not degrading the environment with their mining habits. This is imperative in space mining as well; having an administrative body handle the contracts helps ensure that states can each mine their own celestial bodies and receive certainty that their up-front investment will allow them to mine. The administrative body can be headed by an administrator appointed by the U.N. General Assembly, appointed for a limited term, who then hires staff for the body. The jurisdiction will relate to any "commercial mining operations on a celestial body" for the permits. Its jurisdiction should include both agreements between organizations across borders and fully domestic operations. Even if a space mining company is fully domestic, the effects of their operations affect the whole world when they're in space.

One difference with deep-sea mining is that corporations should not have to request sponsorship from their home country. Though it may be good to have the domestic support of their home government, it is not necessary when the mining occurs in space, and valuable opportunities may slip through the cracks due to domestic disagreements. The administrative body should give out permits similarly to the Japanese system, where parties submit a business plan for approval before they begin operations. The administrator then reviews the application, and as long as the plan properly takes into account the environmental costs of operation, it will be approved. This requires creating an environmental impact report of the potential environmental pollution from the launch and the potential for debris in the atmosphere. To ensure the administrative body is properly incentivized to permit contracts, they should receive a percentage of the profits.

One risk with this system is that it could lead to a conflict of interest where the agency approves more contracts to ensure that it is getting a percentage of earnings. However, this incentive is needed to ensure countries will sign the treaty, and the ISA has shown that sustainable mining can be done even with this incentive to approve contracts.<sup>180</sup> Another solution can be capping the amount of money that the agency receives each year. After it reaches the cap, the agency no longer receives any money. This prevents the agency from indiscriminately accepting every contract. To ensure that there are no windfalls from later arriving mining projects not having to contribute a percentage, the agency could receive the percentage at the end of the year, with adjustments to a lower percentage of total profits if they go over the cap. A second solution would be to open

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<sup>180</sup> See Press Release, The Secretariat of the International Seabed Authority, *supra* note 147.

themselves up to liability in a lawsuit for any failed operations, so they internalize the cost of approving dangerous or irresponsible mining operations.

The administrative body would also be able to work in-kind with the specialized arbitration panel. When problems come up, like a permit is rejected or a party wants to apply for a permit to an asteroid that another party has received a permit to, it can be referred to the arbitration panel to handle the disputes.

## B. A Specialized Arbitration Panel to Handle Space Mining Disputes

The next step is to create a specialized arbitration panel to handle these kinds of disputes. The jurisdiction of the arbitration panel will extend as far as disputes related to permits and the administrative body. This would not include disputes related to the internal mining operations themselves, like a labor dispute or objection over a contractor being paid. However, anything that the regulator finds could impact whether or not the permit should be approved or affect a current permit's standing should be referred to this panel. Therefore, an "internal operation" could be referred to this panel if a new contractor is used, affecting the environmental impact of the operation. This panel should be regarded as the default for the parties to go to, but the treaty should respect the ability to opt out for other dispute resolution methods or panels of the parties' choosing.

Space mining is a highly technical and complicated regime. Therefore, any administrative body that is ruling on the issue must have adequate experience and knowledge of the complicated process. States would likely not legitimize orders and decisions that are handed down from a settlement body that does not have adequate background experience. Similar to the U.S. having a separate court to address the highly technical area of patent law,<sup>181</sup> space mining should be overseen by a dispute settlement body that is knowledgeable in the practices. A petition would have to be filed by a party and would likely be limited to suing another entity that is interfering with its ability to perform its approved contract.

The composition of the space mining arbitration panel can be similar to the SDC. The SDC has eleven members who are selected by a majority of the elected members of the tribunal above them.<sup>182</sup> Since there would be no larger panel above it, the space mining panel should have its members selected by the Space Mining Agency through recommendations submitted by each country, with consideration of geographical and socioeconomic diversity in the countries of

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<sup>181</sup> *About The Court*, UNITED STATES FEDERAL COURT OF APPEALS FOR THE FEDERAL CIRCUIT [perma.cc/7992-DX9E](https://perma.cc/7992-DX9E) (last visited Nov. 17, 2024).

<sup>182</sup> Statute Of The International Tribunal for the Law of the Sea, art. 4, Dec. 10, 1982, 1833 U.N.T.S. 561.

origin for the chosen judges. The recommendations should be lawyers in the respective countries who have a scientific background. Requiring a narrower criterion, like only space law or international dispute resolution, could limit the pool of judges to pick from. The judges should receive “for cause” removal protection to keep them insulated, but also give the agency the ability to monitor and ensure they are acting appropriately in adjudicating disputes.

The international community must establish this dispute settlement mechanism immediately so that it can be ahead of possible conflicts and gain legitimacy. If the world waits until conflict arises, it may be too late to create an effective dispute settlement body. Creating the entity and having parties ready for when a dispute arises will make it easier for states and corporations to turn to it when it occurs. Also, if small disputes arise in the development of the technology or when claims first start to be made to the Agency, the settlement body can prove its value by issuing opinions on these minor disputes. If they can show themselves to be a fair and effective administrative body, they will gain legitimacy with the larger issues. A distinction that is not shared by the Seabed Disputes Chamber is that this proposed solution would be for an arbitration panel, so they will not issue advisory opinions. But, this is less necessary when there is a regulator to help parties conform their behavior to international law.

### C. Criticisms and Counter Arguments

The international regulation of space mining has been criticized, but this does not mean that it would not be effective. One major criticism, given the quantity of asteroids in space and the current state of the industry, is why does there need to be regulation at all? And, even if companies can mine, materials would still have to be cheaper than the terrestrial counterpart for space mining to be relevant.

Though there are currently no disputes over space mining rights, which some people have used as evidence that regulation is not necessary, it is because of current technological limitations in space mining operations. Once states and corporations can mine, there will be disagreements over who gets access to each celestial body. At that point, there needs to be an answer for who has mining rights because of the wasted resources that will go into the losing project. Under the current regime, it would likely just be a first-in-time rule, where whoever gets to the celestial body and extracts the materials keeps it. The problem with the first-in-time rule is the massive waste of resources and lack of certainty in a return on investment. Parties will be in an arms race to deploy their ships first, but the loser will have incurred significant sunk costs on the endeavor. With potentially billions of dollars at stake, it is important to give certainty to the investments that the parties will make, or space mining can become an incredibly wasteful enterprise.

A defender of this position will point to parties baking this risk into the cost, but the lack of certainty with investments could be a prohibitive barrier to entering the market. Companies could be deterred from entering the industry if their investments are not protected, and it could stymie innovation and impact the acquisition of resources in the long run. With the amount of money at stake, there should be a better system.

A second criticism of international regulation is that some countries may not want to join because they would not want to be restricted by a permanent administrative body, or do not want to give up a percentage of their profits. For example, the U.S. did not ratify UNCLOS and did not answer the ISA for its deep-sea mining practices because it did not want to be restricted by an international body. However, given the U.S.'s role in the Artemis Accords, it is likely they will be open to a regulatory body as long as it allows them to engage in space mining practices. The key reason that they did not want to join UNCLOS was because they feared that it would limit their commercial activities or require them to distribute the profits of their investments to other parties.<sup>183</sup> This regulatory body does not come with the same concerns as UNCLOS because the agency is both incentivized to approve contracts to fund its own operations, and there is no requirement for the equal distribution of resources among all countries. Though some money will go to the regulatory body, the potential to monitor an adversary's activity makes it a worthwhile organization to be a part of for space-faring nations. Having these major space actors, like the U.S., on board will help increase the legitimacy of the regulatory body.

A third criticism is that there will be no conflict, and a regulatory body and dispute mechanism would not be necessary for that reason. This is an optimistic point of view because there are quintillions of dollars worth of resources up for grabs in space.<sup>184</sup> Sooner or later, states will try to grab the same asteroid and potentially come to arms over it. States are embroiled in conflicts over precious resources. For example, the United States staunchly defends Taiwan, which is seemingly constantly under threat from China, in large part because of its desire for access to Taiwanese semiconductors.<sup>185</sup> It never hurts for the international community to be prepared to deal with a conflict rather than to be caught off guard and lack the mechanism to solve it.

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<sup>183</sup> See Schrepferman, *supra* note 138.

<sup>184</sup> See The Colossal Value, *supra* note 167.

<sup>185</sup> See generally, Lindsay Maizland, *Why China-Taiwan Relations Are So Tense*, COUNCIL FOREIGN REL., [perma.cc/W5VW-8VFA](https://perma.cc/W5VW-8VFA) (last visited Nov. 17, 2024).

## VI. CONCLUSION

Space mining is going to be a developing industry in the next century. Companies like SpaceX have begun pumping money into operations, the Hayabusa mission showed recent promising success, and deep-sea mining has demonstrated the desire for new methods to gain valuable resources. Once states and corporations begin engaging in the practice, it will be the next frontier of resource conflict. Following guidance from deep-sea mining, space mining should create its own administrative body to regulate contracts and have a specialized arbitration panel to handle disputes.

This solution addresses both of the major problems that arise from space mining. An agency on the front end can help prevent irresponsible mining operations and provide adequate protection for the environment, and then the Arbitration panel can provide the dispute resolution when states disagree. Starting the process now is imperative, and a proactive approach is the only way to ensure that the world does not fall into conflict over potential resources.