

# Unifying Outer Space: Creating a Cohesive Structure Surrounding Mining on the Moon

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*In light of the renewed global interest in Earth's sole natural satellite, this Article ventures into the intricate legal dynamics shaping the development of a lunar mining industry.*

*It starts by illuminating how various models of Outer Space governance can influence three critical aspects of lunar mining: (i) resource ownership rights, (ii) adherence to a non-interference policy, and (iii) commitment to environmental protection. The analysis encompasses a range of legal structures, including (a) the U.N. Outer Space treaties; (b) Alliance-based frameworks such as the Artemis Accords led by the United States, the International Lunar Research Station driven by China, the Principles proposed by the Moon Village Association, and the Building Blocks Framework spearheaded by the Hague International Working Group; as well as (c) national legislations related to space resources coming from the United States, Luxembourg, the United Arab Emirates, and Japan.*

*Addressing the potential confusion that can stem from this diverse legal landscape, the Article proposes the creation of a unifying authority that can streamline this fragmented landscape. Drawing on precedents, the Article underscores the proposed agency's alignment with existing Outer Space governance paradigms. It then argues for this organization's formation under the auspices of the United Nations and provides recommendations on its structure, membership, leadership, and governance.*

*Through the successful implementation of this proposal, this Article hopes that the Moon becomes the epicenter of a thriving mining industry set to fuel humanity's further exploration of the universe.*

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## I. THE START OF A NEW MOON

“*The Moon is the first milestone on the road to the stars.*”<sup>1</sup> – Sir Arthur C. Clarke

Sir Arthur Clarke is not the first person to recognize the importance of Earth’s sole natural satellite.<sup>2</sup> From time immemorial, humanity has always been captivated and intrigued by its closest celestial neighbor. Revered in mythologies,<sup>3</sup> the Moon has been a navigational beacon for explorers,<sup>4</sup> a celebrated muse for poets,<sup>5</sup> and a yardstick for leaders to measure humanity’s own achievements.<sup>6</sup> Thus, the importance of the Moon to the advancement of the human civilization can’t be understated. From Galileo Galilei’s groundbreaking telescopic studies<sup>7</sup> to Neil Armstrong’s momentous “one small step,”<sup>8</sup> the Moon has been a steadfast participant in humanity’s exploration of the unknown. However, for several decades following the

1. European Space Agency (@esa), X (May 30, 2021, 1:11 PM), <https://twitter.com/esa/status/1399096225362857996> [<https://perma.cc/RC6E-3UR5>].

2. See Edward A. Gargan, *For Arthur Clarke, Sri Lanka Is a Link to Space*, N.Y. TIMES (Apr. 7, 1993), <https://www.nytimes.com/1993/04/07/news/for-arthur-clarke-sri-lanka-is-a-link-to-space.html> (“[Clarke] became a familiar face on American television during the late 1960’s when America’s space program pushed toward the moon, and he was at Walter Cronkite’s side when Neil Armstrong plopped his foot on the moon.”).

3. See Nat’l Earth Sci. Tchrs. Ass’n, *Myths About Moon*, WINDOWS TO THE UNIVERSE, <https://www.windows2universe.org/mythology/planets/Earth/moon.html> [<https://perma.cc/5MRJ-4F9H>] (“Many cultures around the world have interesting myths about the Moon, reflecting its prominence in the night sky and its impact on our lives.”).

4. See Viki Moore, *Celestial Navigation – The Moon*, ASTROLABE SAILING (Dec. 19, 2016), <https://astrolabesailing.com/2016/12/19/celestial-navigation-the-moon/> [<https://perma.cc/G42M-8VL9>] (“[T]he moon can be another handy tool to use when it comes to celestial navigation.”).

5. See Raquel Dionísio Abrantes, *Writing Tips for Each Moon Phase*, READ POETRY (May 26, 2020), <https://www.readpoetry.com/writing-tips-for-each-moon-phase> [<https://perma.cc/8QG6-WXQL>] (“Poets and writers of fiction were (and are) inspired by [the Moon], summoning its darker and romantic side.”).

6. See John F. Kennedy, Address at Rice University on the Space Effort (Sept. 12, 1962), <https://www.rice.edu/kennedy> [<https://perma.cc/D5M2-XJH6>] (“We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills . . .”).

7. See Ann Zumwalt, *Galileo’s Moon – Then and Now*, RICE UNIV., [http://galileo.rice.edu/lib/student\\_work/astronomy95/moon.html](http://galileo.rice.edu/lib/student_work/astronomy95/moon.html) [<https://perma.cc/P4XQ-4W5U>] (indicating how Galileo’s observations of the Moon led to the eventual acceptance of Copernicus’s theory that the Sun, rather than the Earth, was the center of movement).

8. ABC Television Stations, ‘*One Small Step for Man’: Moment of Neil Armstrong’s Famous Line*, YOUTUBE, at 00:17 (July 17, 2019), <https://www.youtube.com/watch?v=J6jplPkbe8g> [<https://perma.cc/V8FF-GWCE>].

Apollo Program, humanity's interest in the Moon faded into the abyss.<sup>9</sup> While never entirely forgotten, the Moon slipped quietly into the backdrop as humanity's gaze wandered toward more distant celestial horizons.<sup>10</sup>

But fast-forward to today, there is now a global resurgent interest in the Moon.<sup>11</sup> This rejuvenation is powered by a diverse blend of factors. Technological advancements have opened up new possibilities for the type of activities that can be conducted on the Moon.<sup>12</sup> Apart from its potential as a scientific outpost, the Moon and its untapped treasure trove of resources—such as water ice, rare earth elements, and helium-3—is also an ideal staging environment for humanity's further expansion in and exploration of the universe.<sup>13</sup> In addition, strategic competitions across the globe are fanning the flames of this renewed lunar interest. The democratization of Outer Space has resulted in an expanding list of stakeholders,<sup>14</sup> with private enterprises, developing countries, and traditional space-faring nations all vying for their

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9. See Michael Neufeld, *Why Has It Been 50 Years Since Humans Went to the Moon*, NAT'L AIR & SPACE MUSEUM (Dec. 16, 2022), <https://airandspace.si.edu/stories/editorial/why-50-years-since-humans-went-moon> [<https://perma.cc/C7QS-QJ8T>] (“Although the later landings yielded a huge scientific haul of samples and data, the public did not much care about lunar science's value to understanding solar system history. It seemed like a waste of billions of dollars to voters preoccupied with other problems.”).

10. See *id.* (noting how space agencies became preoccupied with building a permanent space station and exploring Mars).

11. See Kenneth Chang, *Why Everyone Wants To Go Back to the Moon*, N.Y. TIMES (July 12, 2019), <https://www.nytimes.com/2019/07/12/science/nasa-moon-apollo-artemis.html> (“Everyone, it seems, wants to go [to] the moon now.”); see also Eric Berger, *Here Come the Moon Landing Missions (Probably)*, ARS TECHNICA (July 11, 2023, 11:30 AM), <https://arstechnica.com/space/2023/07/here-come-the-moon-landing-missions-probably/> (“As anyone who has been paying attention to space exploration knows, the Moon is red-hot. Up to half a dozen missions may launch to the lunar surface in the next six months, heralding a new era of Moon exploration.”).

12. See Robin McKie, *Everyone's Going Back to the Moon. But Why?*, THE GUARDIAN (July 6, 2019, 1:56 PM), <https://www.theguardian.com/science/2019/jul/06/everyones-going-to-the-moon-again-apollo-11-50th-anniversary> [<https://perma.cc/S6W2-WEVE>] (“These [advancements] promise to transform lunar colonisation in one crucially important way: by reducing the need for the continual presence of humans in hostile environments.”).

13. Neel V. Patel, *Here's How We Could Mine the Moon for Rocket Fuel*, MIT TECH. REV. (May 19, 2020), <https://www.technologyreview.com/2020/05/19/1001857/how-moon-lunar-mining-water-ice-rocket-fuel/> [<https://perma.cc/CN69-XZDA>].

14. See Alex S. Li, *Opening Outer Space: Safety and Stability Through Open Standards and Open Source*, 126 PENN ST. L. REV. 667, 668–69 (2022) (“Once the exclusive realm of governmental agencies, Outer Space is now becoming a popular playground for commercial entities as well.”).

slice of the lunar pie.<sup>15</sup> Venturing back and settling on the Moon now appears to have become a “moral imperative.”<sup>16</sup>

With the Moon’s newfound fame ushering in a complex era of international competition and collaboration,<sup>17</sup> the existing Outer Space governance framework is no longer sufficient.<sup>18</sup> For instance, while international laws state that Outer Space cannot be appropriated by any entity, would this also cover ownership rights over the mined lunar resources?<sup>19</sup> Furthermore, how would different enterprises account for the potential interference that their mining activities could cause to the activities of others?<sup>20</sup> Moreover, what about the environmental impact that these activities could have on the lunar landscape itself?<sup>21</sup> Without adequate answers to these questions, the growth of the lunar mining industry could be stunted.

15. See Chang, *supra* note 11.

16. Alex S. Li, *Another Rendezvous with the Moon: A Moral Imperative*, #THESPACEBAR (July 4, 2019), <https://alexqli.com/thespacebar/2019/7/4/another-rendezvous-with-the-moon-a-moral-imperative> [<https://perma.cc/72FG-CYPP>] (“[Humanity’s] return to the Moon is a moral imperative for the establishment of an operational foundation for further Outer Space exploration.”).

17. See Jan Osburg & Mary Lee, *Governance in Space: Mining the Moon and Beyond*, RAND: THE RAND BLOG (Nov. 18, 2022), <https://www.rand.org/blog/2022/11/governance-in-space-mining-the-moon-and-beyond.html> [<https://perma.cc/KQ6E-SL5M>] (describing the new alliances and competitions taking place related to mining on the Moon).

18. See generally Scott Atkins et al., *Governance in Outer Space: The Case for a New Global Order*, NORTON ROSE FULBRIGHT (Nov. 2022), <https://www.nortonrosefulbright.com/en/knowledge/publications/e8862684/governance-in-outer-space-the-case-for-a-new-global-order> [<https://perma.cc/3N25-D7W2>] (“The existing space governance framework established under the architecture of the five UN space treaties has, in this environment of rapid change and dynamic growth, become outdated.”).

19. See Jaela Bernstien, *Humans Want To Mine the Moon. Here’s What Space Law Experts Say the Rules Are*, CBC (Sept. 1, 2022, 2:00 AM), <https://www.cbc.ca/news/science/moon-mining-outer-space-treaty-1.6568648> [<https://perma.cc/2MGH-5VNU>] (noting that the non-appropriation principle gets more “complicated” when it comes to “mining the moon for resources”).

20. See Cody Knipfer, *Revisiting “Non-Interference Zones” in Outer Space*, THE SPACE REV. (Jan. 29, 2018), <https://www.thespacereview.com/article/3418/1> [<https://perma.cc/LWL2-GKNM>] (indicating the complexity of the non-interference policy’s implementation when it comes to lunar mining activities as “[d]ust and debris kicked up from the lunar regolith during excavation may fall a considerable distance from the mining activity, perhaps past the horizon”).

21. See Dan Robitzski, *Mining Lunar Ice Could Irrevocably Damage the Moon’s Environment*, FUTURISM: THE BYTE (Aug. 21, 2020), <https://futurism.com/the-byte/mining-lunar-ice-irrevocably-damage-moons-environment> [<https://perma.cc/TYM3-SWP3>] (statement of Dr. Paul Lucey) (“Some parts of the moon are very fragile, especially the lunar atmosphere and the coldest parts of the lunar poles . . . Extensive human activity may permanently alter these environments, leading to a loss of the science they can provide.”).

Recognizing these inadequacies, many new legal regimes are being established to tackle questions related to lunar activities.<sup>22</sup> These models provide guidance on three critical areas that could significantly impact the development of the lunar mining industry: ownership rights, non-interference objectives, and environmental policies.<sup>23</sup> However, these new legal structures remain largely untested and are fraught with potential overlaps.<sup>24</sup> With so many legal voices, the resulting complexity could deter participation, impede the industry's growth, and seed potential conflicts. Thus, there is a need for a broadly-accepted authoritative body that can provide clear, consistent, and harmonized guidelines for the lunar mining sector.

This Article seeks to fill this void; it proposes the establishment of a central international authority that can unify the legal landscape surrounding mining on the Moon. In Part II, it starts by providing an overview of the legal regimes that, either indirectly or directly, touch upon the topic of lunar mining. This Part explores how these models all address the three crucial areas surrounding the growth of the lunar mining industry: ownership rights, non-interference objectives, and environmental protection. Noting the medley of legal voices surrounding these critical areas, Part III then promotes the creation of one centralized authority that can uniformly address these topics. In this part, the Article explains how such an international council could bring certainty into this arena by ordering these diverse legal regimes into one systemic implementable structure. Acknowledging that critics might argue the establishment of such a governance model might not fit the existing legal contours for Outer Space, Part IV then assuages these concerns by drawing parallels to other established precedents. Finally, in Part V, this Article lays out a detailed blueprint for such a council. It dives into its potential organizational framework, membership composition, leadership structure, and governance processes.

Through the creation of such a unifying authority, it is my hope that the lunar mining industry will become a sector that exemplifies the best of humanity's shared principles: advancement, fairness, and respect for all stakeholders.

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22. *See infra* Sections II.B–II.C.

23. *See infra* Part II.

24. *See infra* Part III.

## II. THE EVOLVING LUNAR MINING LEGAL LANDSCAPE

While the lunar mining legal landscape remains nascent, several international treaties, agreements, and governing documents have—either implicitly or explicitly—addressed this emerging field. This Part will illuminate how provisions related to (i) ownership rights, (ii) non-interference policies, and (iii) environmental protection within these structures have shaped the current legal environment for lunar mining. The first section examines how the United Nations Treaties on Outer Space—the foundational pillars of international Outer Space law—would treat activities related to lunar resource extraction. With this groundwork in place, the subsequent section explores how several alliance-based frameworks have refined the legal framework pertaining to mining activities on the Moon. Finally, this Part will conclude through an analysis of how several recently-enacted national laws addressing Outer Space resources have strengthened the legality of the lunar mining industry.

### A. *United Nations Treaties*

As the first set of international agreements focused specifically on Outer Space, the United Nations Treaties on Outer Space are considered the *sine qua non* foundation of legal doctrine related to Outer Space.<sup>25</sup> Of these five treaties, only four have secured widespread acceptance.<sup>26</sup> Given their broad scope, some of these treaties could impact lunar mining activities through three areas: ownership rights, non-interference objectives, and environmental policies. These influences are most evident in two particular agreements: (1) the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space,<sup>27</sup> often referred to as the Outer Space Treaty, and (2) the Agreement Governing the Activities of States on the Moon and Other

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25. Alex S. Li, *Ruling Outer Space: Defining the Boundary and Determining Jurisdictional Authority*, 73 OKLA. L. REV. 711, 714–15 (2021) (noting that these agreements “have laid the seminal foundation for doctrinal law in this sector”).

26. See Li, *supra* note 14, at 673 (indicating that all but the Moon Agreement have been widely ratified).

27. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty] (entered into force Oct. 10, 1967).

Celestial Bodies,<sup>28</sup> more commonly known as the Moon Agreement. This section will provide an overview of the legal ramifications that these two agreements could have on lunar mining activities.

### 1. The Outer Space Treaty

As the first ever international agreement governing activities in Outer Space, the Outer Space Treaty serves as the cornerstone of all legal doctrines related to this sector.<sup>29</sup> Negotiated during the height of the Cold War and coming into force on October 10, 1967, this treaty ensures that Earth-based geopolitical tensions do not extend into Outer Space by mandating that only peaceful pursuits can take place in this realm.<sup>30</sup> As of beginning of 2024, 114 countries are parties to the agreement with an additional twenty-two signatories that have yet to formally ratify.<sup>31</sup> Conceived in an era when human activity in Outer Space was in its infancy, the Outer Space Treaty is designed to act more as a proclamation of principles for this environment.<sup>32</sup> Thus, while the Outer Space Treaty does not directly address lunar resources, several of its tenets do have considerable implications for lunar mining activities.

First, the Outer Space Treaty has several provisions concerning property rights that can indirectly affect lunar mining activities. In its first article, the treaty proclaims that the “exploration and use of . . . the [M]oon” is in the “province of all mankind” and such rights shall be available equally for all

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28. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, *opened for signature* Dec. 18, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement] (entered into force July 11, 1984).

29. See Li, *supra* note 25, at 715 (“The Outer Space Treaty is the *sine qua non* foundation of Outer Space legal doctrine.”); see also Li, *supra* note 14, at 673–74 (indicating that the Outer Space Treaty of 1967 has become the “bedrock of legal doctrine regarding Outer Space”).

30. Outer Space Treaty, *supra* note 27, 18 U.S.T. at 2416–17, 610 U.N.T.S. at 206 (“[The parties recognize] the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes.”).

31. Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., Status of International Agreements Relating to Activities in Outer Space as at 1 January 2023, at 12, U.N. Doc. A/AC.105/C.2/2023/CRP.3 (Mar. 20, 2023) [hereinafter U.N. Treaties Status], [https://www.unoosa.org/res/oosadoc/data/documents/2023/aac\\_105c\\_22023crp/aac\\_105c\\_22023crp\\_3\\_0\\_html/AC105\\_C2\\_2023\\_CRP03E.pdf](https://www.unoosa.org/res/oosadoc/data/documents/2023/aac_105c_22023crp/aac_105c_22023crp_3_0_html/AC105_C2_2023_CRP03E.pdf) [<https://perma.cc/E7NJ-33E3>]; *Status of International Agreements Relating to Activities in Outer Space*, U.N. OFF. FOR OUTER SPACE AFFS., <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/status/index.html> [<https://perma.cc/LQY6-CR57>].

32. See Li, *supra* note 25, at 717 (“Developed at a time when space-related activities were still in their infancy, the treaty is designed to be simple.”).

States to enjoy.<sup>33</sup> Through this statement, the agreement appears to suggest that all States might possess certain ownership rights, such as control and enjoyment, that are typically associated with real property.<sup>34</sup> However, the Outer Space Treaty expressly eliminates real property ownership rights in its subsequent article. Specifically, Article II declares that “Outer [S]pace, including the [M]oon . . . is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.”<sup>35</sup> This provision raises questions about whether mining activities could constitute a form of impermissible “appropriation” under the treaty.<sup>36</sup> Furthermore, Article XII could also indirectly impact a nation’s ownership rights over its “stations, installations, equipment, and space vehicles on the [M]oon” by stating that such objects must be open to all other State parties.<sup>37</sup> Consequently, should a country place proprietary mining stations and equipment on the Moon, this provision can enable other countries to scrutinize such mining apparatuses. This exposure could potentially reveal sensitive lunar mining trade secrets, know-hows, and technical expertise.

The Outer Space Treaty’s non-interference principle could also significantly impact lunar mining activities. Specifically, the treaty mandates that a State must ensure that its Outer Space activities do not cause “harmful interference with the activities of other state parties in the peaceful exploration and use of [O]uter Space.”<sup>38</sup> This principle reflects this treaty’s core vision that all Outer Space activities should be conducted in the spirit of

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33. Outer Space Treaty, *supra* note 27, 18 U.S.T. at 2412–13, 610 U.N.T.S. at 207–08.

34. See, e.g., *Bundle of Rights in Real Estate: Importance of Ownership Rights*, MASTERCLASS (June 8, 2021), <https://www.masterclass.com/articles/bundle-of-rights-in-real-estate> [<https://perma.cc/49LY-7VXT>] (noting that two of the five major rights in the “bundle of rights” associated with real property ownership are the “right of enjoyment” and the “right of control”); Molly Grace, *A Guide to Understanding Bundle of Rights in Real Estate*, ROCKET (Feb. 26, 2023), <https://www.rocketmortgage.com/learn/bundle-of-rights> [<https://perma.cc/8HR2-FQVS>] (indicating that the “right of control” and the “right of enjoyment” are two of the five rights in the “bundle of rights”).

35. Outer Space Treaty, *supra* note 27, 18 U.S.T. at 2413, 610 U.N.T.S. at 208.

36. See Mark J. Sundahl, Dir., Glob. Space L. Ctr., *Returning to the Moon: Legal Challenges as Humanity Begins to Settle the Solar System – Full Transcript* (Mar. 6, 2020), in 9 GLOB. BUS. L. REV. 1, 16 (2021) (“There are debates about the meaning of [appropriation] and how this prohibition impinges on the right . . . to extract natural resources from the moon . . .”); see also Tanja Masson-Zwaan & Mark J. Sundahl, *The Lunar Legal Landscape: Challenges and Opportunities*, 46 AIR & SPACE L. 29, 31 (2021) (suggesting that future lunar governance systems need to address “whether extracting and commercializing lunar resources is in line with [appropriation] provisions of the Outer Space Treaty”).

37. Outer Space Treaty, *supra* note 27, 18 U.S.T. at 2411, 610 U.N.T.S. at 211.

38. *Id.* 18 U.S.T. at 2417, 610 U.N.T.S. at 210.

“promoting international co-operation and understanding.”<sup>39</sup> Hence, in the context of mining for resources on the Moon, the treaty prohibits a party from adversely affecting other parties’ lunar pursuits. Additionally, when gathering resources, the mining party must demonstrate “due regard to the corresponding interest of all other State Parties.”<sup>40</sup> This broad principle can influence lunar mining activities in multifaceted ways. For instance, if a company’s drilling activities generate seismic effects that detrimentally harm another party’s study of lunar tectonic activities,<sup>41</sup> then it could run afoul of the Outer Space Treaty. Therefore, the principle of non-interference must be considered when determining the location and nature of lunar mining activities.

Lastly, the Outer Space Treaty also institutes an environment-centric principle that could influence lunar mining activities. Article IX of the treaty stipulates that all parties must explore Outer Space without causing any “harmful contamination.”<sup>42</sup> This criterion effectively prohibits any activities that can adversely transform the Outer Space environment; this principle is aligned with the agreement’s overarching aim of ensuring that the “exploration and the use of [O]uter [S]pace” remain within the “province of all mankind.”<sup>43</sup> Therefore, all State parties are obligated to prevent their activities from adversely impacting the availability or viability of various Outer Space environments—including the Moon—for the benefit of others and future generations to come. But lunar resource extraction may affect the lunar ecosystem. Drilling for lunar resources can potentially disrupt the area where such activities take place. In addition, mining activities could also generate dust clouds that may disperse over other lunar regions as well. As a result, in order to comply with the Outer Space Treaty, lunar mining entities might need to first conduct an environmental assessment of their planned activities.

Thus, the Outer Space Treaty’s principles concerning ownership rights, non-interference, and environmental protection could legally impact lunar mining activities. But even with such influence, the Outer Space Treaty does not specifically address mining activities on the Moon. Yet, within this

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39. *Id.* 18 U.S.T. at 2413, 610 U.N.T.S. at 208.

40. *Id.* 18 U.S.T. at 2416, 610 U.N.T.S. at 209–10.

41. See Adam Mann, *The Moon May Be Tectonically Active, and Geologists Are Shaken*, NAT’L GEOGRAPHIC (May 13, 2019), <https://www.nationalgeographic.com/science/article/moon-may-be-tectonically-active-geologists-shaken-apollo-moonquakes> [<https://perma.cc/DF6U-QR28>] (noting that the Moon has tectonic activities that are being studied).

42. Outer Space Treaty, *supra* note 27, 18 U.S.T. at 2416, 610 U.N.T.S. at 210.

43. *Id.* 18 U.S.T. at 2412, 610 U.N.T.S. at 207.

collection of five United Nations Treaties on Outer Space, there is one agreement that is surgically focused on lunar activities: the Moon Agreement. The following subsection will delve into how this treaty can legally impact lunar mining.

## 2. The Moon Agreement

Despite being one of the five major United Nations Treaties on Outer Space, the Moon Agreement is largely considered a failed agreement.<sup>44</sup> As of beginning of 2024, only eighteen countries—one of which, Saudi Arabia, formally withdrew on January 5, 2024—are parties to the Moon Agreement with an additional four that have signed but not ratified the agreement.<sup>45</sup> With the lack of widespread support, the legitimacy of this treaty in governing lunar activities seems unclear.<sup>46</sup> But given that the Moon Agreement was authored by the same organization that drafted the Outer Space Treaty,<sup>47</sup> the principles outlined within the Moon Agreement can provide insights into how an influential voice, that of the United Nations, could shape the eventual debate on lunar mining and the management of the mined resources.

In terms of lunar resources, the Moon Agreement advocates for the establishment of an “equitable warehouse” that all States can contribute to and withdraw from. The agreement dictates that the Moon’s natural resources are “the common heritage of mankind.”<sup>48</sup> Therefore, the Moon Agreement insists that lunar resources should be available to all “on a basis of equality.”<sup>49</sup> Consequently, a system must be developed in which non-spacefaring nations can share in the benefits of such lunar resources.<sup>50</sup> Despite the limited adoption of the Moon Agreement, this system—if implemented—could

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44. See Li, *supra* note 25, at 722 (noting “its lack of acceptance among space-faring nations”).

45. U.N. Treaties Status, *supra* note 31, at 12, 12 n.c.

46. See Li, *supra* note 14, at 676 (“Because most space-faring nations . . . have not ratified, signed, or acceded to the Moon Treaty, the agreement does not have widespread practical effect.”).

47. *Id.* (indicating that the United Nations Committee on the Peaceful Uses of Outer Space had drafted all five major United Nations Treaties on Outer Space).

48. Moon Agreement, *supra* note 28, at 25.

49. *Id.*

50. See *id.* (“An equitable sharing by all States Parties in the benefits derived from these resources, whereby the interests and needs of the developing countries . . . shall be given special consideration.”).

mirror the “Enterprise” concept found in the Law of the Sea.<sup>51</sup> Under this arrangement, mining entities would deposit a portion of the lunar resources they gathered into this warehouse, enabling non-spacefaring nations to use those resources for their own research and development.<sup>52</sup>

Apart from establishing this equitable warehouse, the Moon Agreement also outlines several principles that could implicitly impact lunar mining activities. These principles pertain to ownership rights, non-interference, as well as environmental protection.

When it comes to property rights, the Moon Agreement reaffirms the Outer Space Treaty’s principle that the “[M]oon is not subject to national appropriation by any claim of sovereignty, by means of use or occupation, or by any other means.”<sup>53</sup> However, the Moon Agreement further reinforces this principle by stating that the placement of any objects or personnel on or below the surface of the Moon does not constitute any “right of ownership.”<sup>54</sup> The treaty essentially treats all nations and enterprises as mere occupants on the Moon. Indeed, the Moon Agreement declares that if a country establishes a lunar station, it must only utilize the minimal amount of lunar area necessary for the “needs of the station.”<sup>55</sup> This limitation on land ownership makes it difficult to assert ownership rights over the lunar resources extracted from such land. Lacking strong ownership rights and subjected to equitable contribution, entities pursuing lunar mining activities could have a difficult time in raising the capital needed to fund their operations.

The Moon Agreement’s provision on non-interference could also affect an organization’s lunar mining operations. Proclaiming the Moon as humanity’s common heritage, the agreement not only explicitly forbids any threatening or hostile acts on the Moon,<sup>56</sup> but it also encourages all parties to conduct their lunar endeavors with emphasis on “co-operation and mutual assistance.”<sup>57</sup> Therefore, all parties must ensure their lunar activities will not

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51. See Michael Listner, *The Moon Treaty: Failed International Law or Waiting in the Shadows?*, SPACE REV. (Oct. 24, 2011), <https://www.thespacereview.com/article/1954/1> [<https://perma.cc/VE4M-EYC6>] (“[I]t is probable that it would be similar in form to the international regime called ‘The Enterprise.’”).

52. See *id.* (“The nature of the Enterprise was envisioned to oversee developed nations and private companies operating under their jurisdiction and would have required a portion of the mineral wealth mined from the ocean floor to be allocated to the Enterprise for distribution among the developing countries.”).

53. Moon Agreement, *supra* note 28, at 25.

54. *Id.*

55. *Id.* at 24.

56. *Id.* at 23.

57. *Id.*

interfere with the activities of others and should strive to minimize conflicts through consultations.<sup>58</sup> To decrease the chances of interference, all entities must also coordinate their activities if they are operating within the same lunar region or orbit.<sup>59</sup> Furthermore, according to the agreement, a country's drilling station cannot "impede the free access to all areas of the [M]oon" by personnel and objects of other nations.<sup>60</sup> In fact, other State parties to the Moon Agreement could perform audits to ensure an entity's lunar activities comply with the provisions of the Moon Agreement.<sup>61</sup>

These provisions related to non-interference could severely constrain the development of the lunar mining industry. The process of mineral extraction will undoubtedly disrupt the activities of others within the drilling zone. In addition, the party conducting mining operations will likely need to coordinate with multiple counterparties to mitigate any harmful effects, such as dust storms or seismic activities that may result from the mining process.<sup>62</sup> Consequently, mining activities may be restricted to remote areas, potentially limiting access to resource-rich environments. Furthermore, the Moon Agreement's audit provision might deter companies from investing in mining technologies; the risk of inadvertently revealing trade secrets, such as custom-manufactured equipment or specialized techniques, during foreign visits could be a significant disincentive.

Lastly, the Moon Agreement's environmental provisions could also have significant implications for the expansion of lunar mining activities. Specifically, the treaty requires all entities to ensure that they do not disrupt the Moon's "existing balance" whether through "adverse changes" or "harmful contamination."<sup>63</sup> To comply with this provision, prior to commencing mining activities, entities might need to carry out extensive analysis of how their mining activities could impact the lunar ecosystem. Additionally, parties to the agreement may designate areas of special scientific interest as "international scientific preserves," which could further

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58. *Id.* at 24–25.

59. *Id.* at 23.

60. *Id.* at 24.

61. *Id.* at 26.

62. See Eric Nüiler, *The Next Big Challenge for Lunar Astronauts? Moon Dust*, WIRED (Aug. 19, 2021, 7:00 AM), <https://www.wired.com/story/the-next-big-challenge-for-lunar-astronauts-moon-dust/> (indicating that dust particles could have a harmful effect on human health); see also Charles Q. Choi, *Moonquakes Rattle the Moon as It Shrinks like a Raisin*, SPACE.COM (May 13, 2019), <https://www.space.com/moonquakes-moon-is-shrinking-apollo-data.html> [<https://perma.cc/8J26-SQEJ>] (explaining that the Moon is tectonically active like Earth).

63. Moon Agreement, *supra* note 28, at 24.

limit the regions available for resource extraction.<sup>64</sup> The Moon Agreement also encourages the consideration of both the “present and future generations” when conducting lunar activities.<sup>65</sup> This suggests that mining companies should contemplate the long-term effects of their operations on the lunar environment. All together, these environmental stipulations could increase the cost associated with establishing and running lunar mining operations.

Drafted during the first Space Age, the Moon Agreement sets forth several principles that could impact lunar mining activities. The agreement’s lack of acceptance may largely be attributed to these provisions that impose considerable restrictions on spacefaring entities’ mining activities on the Moon. Thus, the international community is still left without a definitive framework in place that explicitly addresses lunar mining activities, including the treatment of the mined resources.

Although the Outer Space Treaty and the Moon Agreement both pose certain limitations on lunar mining activities, neither explicitly prohibits such operations. But the resurging interest in lunar exploration has prompted renewed efforts in establishing a concrete set of guidelines for governance of activities on the Moon. These emerging frameworks are designed to honor the spirit of the United Nations Treaties on Outer Space while simultaneously to provide more legal certainty and validity to lunar activities such as resource extraction. The next section will examine these more recent international efforts in establishing guidelines for lunar activities and their potential legal impact on lunar mining.

### B. Alliance-Based Agreements

With the recent upswing in commercial space activities,<sup>66</sup> interest in the Moon is piquing again. It is highly plausible that humanity could establish several permanent lunar settlements within the next two decades.<sup>67</sup> The rise

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64. *Id.*

65. *Id.* at 23.

66. See Li, *supra* note 14, at 669 (“In fact, commercial companies will launch more objects to Outer Space in the next few years than humanity has in the first sixty-year history of the Space Age.”); see also Alex S. Li, *Touring Outer Space: The Past, Present, and Future of Space Tourism*, 71 CLEV. ST. L. REV. 743, 747 (2023) (“Over the course of the last decade, access to Outer Space has become more democratized with the sector becoming increasingly commercialized.”).

67. See Andrew Jones, *NASA and China Are Eyeing the Same Landing Sites near the Lunar South Pole*, SPACENEWS (Aug. 31, 2022), <https://spacenews.com/nasa-and-china-are-eyeing-the->

in participation and attention from various sovereign states and entities could trigger a race for control over resource-rich lunar regions.<sup>68</sup> However, such a scramble might result in conflicts with potentially severe consequences. Given the limitations of existing international treaties in resolving the tensions underlying these conflicts,<sup>69</sup> there is a need for alternative solutions.

As a result, there are efforts underway to formulate new international guidelines to govern various lunar activities. This section delves into four such emerging frameworks that have been gaining popular traction: (1) the Artemis Accords led by the United States, (2) the International Lunar Research Station driven by China, (3) the Principles proposed by the Moon Village Association, and (4) the Building Blocks Framework spearheaded by the Hague International Working Group. In particular, this portion of the Article examines these governance models' legal impact on lunar mining activities, with a specific focus on ownership rights, non-interference policies, and environmental protection.

### 1. The United States-Led Artemis Accords

Amidst a new space race to establish the first permanent base in a resource-rich lunar area,<sup>70</sup> the United States saw an urgent need to reboot its manned lunar spaceflight program.<sup>71</sup> As the only nation so far to have successfully landed humans on the Moon,<sup>72</sup> America has no intention of relinquishing its lead. Hence in 2017, under Space Policy Directive-1, the United States' space agency—National Aeronautics and Space Administration (“NASA”)—was tasked with the mission of returning

same-landing-sites-near-the-lunar-south-pole/ [https://perma.cc/WSH5-Q25M] (indicating that both China and the United States want to land at the same region of the Moon).

68. *Id.* (“It is prime lunar real estate for in-situ resource utilization. This could be the first potential point of conflict over resources beyond Earth.”).

69. See Leonard David, *Space Mining Startups See a Rich Future on Asteroids and the Moon*, SPACE.COM (Jan. 7, 2023), <https://www.space.com/space-mining-grinding-into-reality> [https://perma.cc/J5WH-49FJ] (statement of Dr. Angel Abbud-Madrid) (“You see consensus that the UN Outer Space Treaty is not necessarily blocking the extraction of resources. It doesn’t allow you to own the planetary body. But in terms of law, how do you do it in an organized, efficient, sustainable and responsible way? It’ll take diplomacy.”).

70. See Chang, *supra* note 11 (noting how the rich deposits of water on the Moon are attracting the United States back to the Moon).

71. See *id.* (“‘NASA is highly motivated,’ Jim Bridenstine, the former Oklahoma congressman and Navy pilot picked by President Trump to be the agency’s administrator, said in an interview. ‘We now have a very clear direction.’”).

72. Tom Urbain, *How Many Countries Have Been to the Moon?*, STARLUST (Oct. 18, 2023), <https://starlust.org/countries-that-have-been-to-the-moon/> [https://perma.cc/Q639-KL5P].

“humans to the Moon for long-term exploration and utilization.”<sup>73</sup> In response, NASA established the Artemis Program to achieve this goal.<sup>74</sup> Named after the mythical Greek goddess and the twin sister of Apollo, the Artemis Program was designed to bridge America’s historic lunar past—the Apollo Program—with its future aspirations for the Moon and further deep space exploration.<sup>75</sup>

But in contrast to the Apollo Program,<sup>76</sup> this time around, the United States has no intention of venturing into deep space alone. One of the key objectives of the Artemis Program is for NASA to collaborate with international partners to develop “a sustainable and robust presence on the Moon.”<sup>77</sup> Therefore, the program’s governing document, the Artemis Accords, places a heavy emphasis on the principle of international cooperation.<sup>78</sup> In fact, the term “Accords” was deliberately selected to evoke the spirit of international cooperation depicted in a landmark peace treaty in the fictional Star Trek universe.<sup>79</sup> Relatedly, NASA publicly revealed the Artemis Accords only

73. Reinvigorating America’s Human Space Exploration Program, 82 Fed. Reg. 59501, 59501 (Dec. 11, 2017).

74. See NAT’L AERONAUTICS & SPACE ADMIN., ARTEMIS PLAN: NASA’S LUNAR EXPLORATION PROGRAM OVERVIEW (2020), [https://www.nasa.gov/sites/default/files/atoms/files/artemis\\_plan-20200921.pdf](https://www.nasa.gov/sites/default/files/atoms/files/artemis_plan-20200921.pdf) [<https://perma.cc/CAB8-FXLD>] (“The Artemis program builds on a half-century of experience and preparation to establish a robust human-robotic presence on and around the Moon. . . . NASA was ready for Space Policy Directive-1, the call from the President to return to the Moon and get ready for Mars . . .”).

75. Alex S. Li, *The Artemis Accords: Moonwalking to More Giant Leaps*, #THESPACEBAR (Aug. 17, 2020), <https://alexqli.com/thespacebar/2020/8/17/the-artemis-accords-a-moonwalk-to-more-giant-leaps> [<https://perma.cc/T3VK-C5FB>].

76. See generally *How Much Did the Apollo Program Cost?*, PLANETARY SOC’Y, <https://www.planetary.org/space-policy/cost-of-apollo> [<https://perma.cc/LKG4-35UB>] (noting that Project Apollo was solely funded by the United States).

77. *The Artemis Accords*, NASA, <https://www.nasa.gov/specials/artemis-accords/index.html> [<https://perma.cc/GQ77-PUFD>].

78. See *The Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes*, *opened for signature* Oct. 13, 2020, 62 I.L.M. 893 [hereinafter *Artemis Accords*], [https://www.cambridge.org/core/services/aop-cambridge-core/content/view/5874DB518591888E52CF2B816E4593F0/S0020782923000177a.pdf/artemis\\_accords.pdf](https://www.cambridge.org/core/services/aop-cambridge-core/content/view/5874DB518591888E52CF2B816E4593F0/S0020782923000177a.pdf/artemis_accords.pdf) [<https://perma.cc/G6UT-FMKR>] (stating that the signatories to the Accords will build on the legacy of the Apollo Program by cooperating for “the benefit of all humankind”).

79. See Anthony Colangelo, *T+217: Artemis Accords, with Mike Gold*, MAIN ENGINE CUT OFF, at 10:05 (May 16, 2022), <https://mainenginecutoff.com/podcast/217> [<https://perma.cc/TET2-49BT>] (statement of Mike Gold, Executive Vice President of Civil Space and External Affairs, Redwire) (“[I]n Star Trek 6, there were the Khitomer Accords that brought the Klingons and the Federation together. And that resonated with me because the Artemis Accords were designed to bring the world together and to support the values of Star Trek, which

after the agency had received substantive endorsement from several countries.<sup>80</sup> This was accomplished on October 13, 2020 when the Artemis Accords was officially adopted with seven other nations joining the United States as signatories.<sup>81</sup> Since then, many more countries have signed on. As of beginning of 2024, thirty-three countries are partners to the Artemis Accords.<sup>82</sup>

Setting a set of “rules of the road” for this international coalition, the Artemis Accords intend to ensure that lunar exploration will contribute to the development of a “peaceful and prosperous future for all of humanity.”<sup>83</sup> As part of this vision, the agreement enunciates several principles related to the extraction of lunar resources. However, the Accords’ provision related to lunar resources directly contradicts that of the Moon Agreement. Yet, this contradiction was done intentionally. Despite the Artemis Accords’ assertion of compliance with various United Nations Treaties on Outer Space, it pointedly excludes the Moon Agreement.<sup>84</sup>

Regarding these lunar resources, the Artemis Accords asserts “that the extraction and utilization of space resources, including any recovery from the surface or subsurface of the Moon . . . does not inherently constitute national appropriation.”<sup>85</sup> With this provision, the Artemis Accords essentially sidesteps the issue of *land* ownership while still enabling such mining activities. By specifically focusing on the lunar resources themselves rather than the lunar region where the mining takes place, the Artemis Accords does not explicitly violate the non-appropriation provision of the Outer Space Treaty.<sup>86</sup> This is because the agreement reads the non-appropriation principle

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[are] diverse, inclusive, science- and discovery-oriented values to build better technology and a better future for us all. And so Star Trek certainly did . . . inspire the Accords.”)

80. See *id.* at 42:20 (“[Y]ou want enough countries to initially sign [so] that it’s substantive. . . . [E]ight seemed like it would be substantive but still manageable in developing the text; ambitious, but manageable.”).

81. See Christian Davenport, *Seven Nations Join the U.S. in Signing the Artemis Accords, Creating a Legal Framework for Behavior in Space*, WASH. POST (Oct. 13, 2020, 12:45 PM), <https://www.washingtonpost.com/technology/2020/10/13/artemis-moon-mining-agreement-signed/> [<https://perma.cc/E5W2-S8YA>] (“NASA announced Tuesday that seven nations have joined the United States in signing the Artemis Accords . . .”).

82. *The Artemis Accords*, *supra* note 77.

83. Colangelo, *supra* note 79, at 13:15.

84. See Artemis Accords, *supra* note 78, at 894 (affirming all the United Nations Treaties related to Outer Space except for the Moon Agreement).

85. *Id.* § 10(2).

86. See *supra* Section II.A.1; see also Outer Space Treaty, *supra* note 27, 18 U.S.T. at 2413, 610 U.N.T.S. at 205 (“Outer space, including the [M]oon and other celestial bodies, is not subject

as directed solely to the ownership of the land itself rather than a specific use case of the land. As support, the Artemis Accords essentially borrows the concept of fishing rights over international waters from the Law of the Sea.<sup>87</sup>

But the Artemis Accords does set certain conditions regarding its members' lunar mining activities. First, members are required to publicly disclose their lunar mining activities.<sup>88</sup> Second, members must use the knowledge gained from their mining activities to aid in the refinement of the guidelines and regulations related to the extraction and utilization of space resources.<sup>89</sup> Third, with provisions that aim to protect historic Outer Space sites, the Artemis Accords would prohibit mining operations in certain lunar locations, such as Apollo 11's landing site.<sup>90</sup> These provisions effectively establish environmental regulations for the Moon.

Furthermore, the Artemis Accords' non-interference principle ensures that its members' mining activities are conducted in ways that do not negatively affect other parties' activities.<sup>91</sup> This includes the establishment of "safety zones," within which a member's lunar mining activities must be coordinated to ensure that others' operations are not harmfully impacted.<sup>92</sup>

By sidestepping the question of *land* ownership while affirming the right to extract and utilize lunar resources, the Artemis Accords creates a framework that legally permits lunar mining. However, the Accords also sets certain boundaries on these mining rights to ensure that such activities do not harmfully interfere with others' operations or negatively affect the lunar environment. Therefore, the Artemis Accords represents a major milestone in reshaping the legal landscape for lunar mining.

While the Artemis Accords led by the United States is likely to play a significant role in shaping future lunar governance, it is not the sole government-led initiative in this field. Halfway around the world, the China-driven International Lunar Research Station Cooperation Organization is also gaining momentum. The next section offers an overview of this emerging partnership.

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to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.").

87. See discussion *infra* Section II.C.1.

88. Artemis Accords, *supra* note 78, § 10(3).

89. *Id.* § 10(4).

90. *Id.* § 9(1).

91. See *id.* § 11(4) ("The Signatories commit to seek to refrain from any intentional actions that may create harmful interference with each other's use of outer space in their activities under these Accords.").

92. *Id.* § 11(7).

## 2. The China-Driven International Lunar Research Station

While China was more of an observer in the first Space Race, it is keenly positioning itself at the forefront of this century's new space race. In 2021, China unveiled its latest white paper detailing its Outer Space policies for the ensuing five years.<sup>93</sup> In it, China declared its ambition to become a new space power.<sup>94</sup> As a part of this objective, becoming a leader in lunar exploration is one of the Chinese space program's strategic goals.<sup>95</sup>

Similar to the United States,<sup>96</sup> China envisions a collaborative lunar journey. Thus in 2021, through its space agency—the China National Space Administration (“CNSA”)—China articulated its vision for an international lunar partnership.<sup>97</sup> Initially introduced jointly by China and Russia, the International Lunar Research Station Cooperation Organization (“ILRSCO”)<sup>98</sup> has since matured into an initiative prominently spearheaded by China.<sup>99</sup>

Under the umbrella of this international partnership, China wants to develop a comprehensive, multi-functional research station on the Moon—

93. See *China's Space Program: A 2021 Perspective*, THE STATE COUNCIL INFO. OFF. OF THE PEOPLE'S REPUBLIC OF CHINA (Jan. 28, 2022) [hereinafter *China Space Policy*], [https://english.www.gov.cn/archive/whitepaper/202201/28/content\\_WS61f35b3dc6d09c94e48a467a.html](https://english.www.gov.cn/archive/whitepaper/202201/28/content_WS61f35b3dc6d09c94e48a467a.html) [<https://perma.cc/6BRF-TGYD>] (“We are publishing this white paper to offer a brief introduction to China's major achievements in this field since 2016 and its main tasks in the next five years, in order to help the international community better understand China's space industry.”).

94. *Id.*

95. See Vivian Wang, *China Announces Plan To Land Astronauts on Moon by 2030*, N.Y. TIMES (May 29, 2023), <https://www.nytimes.com/2023/05/29/world/asia/china-space-moon-2030.html> (“Mr. Lin said the moon landing project, part of the country's broader Lunar Exploration Project — also known as the Chang'e Project, for the Chinese moon goddess — had ‘recently’ been kick-started . . .”).

96. See *supra* Section II.B.1.

97. CHINA NAT'L SPACE ADMIN., INTERNATIONAL LUNAR RESEARCH STATION GUIDE FOR PARTNERSHIP (June 2021), <https://www.cnsa.gov.cn/english/n6465652/n6465653/c6812150/content.html> [<https://perma.cc/99W8-FWZG>].

98. See Andrew Jones, *China To Establish Organization To Coordinate International Moon Base*, SPACENEWS (Apr. 28, 2023), <https://spacenews.com/china-to-establish-organization-to-coordinate-international-moon-base/> [<https://perma.cc/N7P9-ZKCB>] (“International Lunar Research Station Cooperation Organization (ILRSCO) would soon be established to coordinate and manage the construction of the ILRS moon base.”).

99. See Andrew Jones, *China Attracts Moon Base Partners, Outlines Project Timelines*, SPACENEWS (June 19, 2023), <https://spacenews.com/china-attracts-moon-base-partners-outlines-project-timelines/> [<https://perma.cc/P4T3-JD7P>] (“The ILRS was first presented in 2021 as a joint project by China and Russia. It is now described as a project proposed by China and to be jointly built by many countries.”).

named International Lunar Research Station (“ILRS”)—by the early 2030s.<sup>100</sup> This ILRS initiative will proceed through three phases: reconnaissance, construction, and utilization.<sup>101</sup> The first phase, reconnaissance, is set for the 2020s and will encompass missions to find an optimal lunar location for the research facility as well as missions to enhance lunar soft-landing techniques.<sup>102</sup> Subsequently, the 2030s will usher in the construction phase, with the research station anticipated to be completed by 2035.<sup>103</sup> Upon ILRS’s completion, the utilization phase will commence, signaling the ILRS’s transition to full operational status.<sup>104</sup> At that point, all ILRSCO partners can leverage the ILRS both as a state-of-the-art research hub and a testing site for new innovative technologies.<sup>105</sup>

As of beginning of 2024, the governing agreements for ILRSCO remain under development.<sup>106</sup> Nevertheless, a diverse array of stakeholders—spanning countries, commercial enterprises, inter-governmental entities, and non-governmental organizations—have already rallied behind this initiative.<sup>107</sup> Because the governing framework is yet to be publicly released, its exact legal effects on lunar mining activities are to be determined.

But given China’s predominant role in leading the ILRS initiative,<sup>108</sup> its official space policies could provide clues on various ILRSCO’s positions. In particular, China’s publicly-disseminated Outer Space white paper emphasized China’s intention to “advance cooperation” on the ILRS initiative.<sup>109</sup> Although the document does not enumerate explicit policy stances for the ILRSCO, it does delineate China’s areas of focus for international cooperation in its Outer Space endeavors.<sup>110</sup> These stances may

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100. CHINA NAT’L SPACE ADMIN., *supra* note 97, at 2, 4.

101. *Id.* at 4–5.

102. *Id.* at 4.

103. *Id.* at 4–5.

104. *Id.* at 5.

105. *Id.* at 2.

106. See Jones, *supra* note 99 (“China aims to define ILRS task sharing and sign and approve intergovernmental agreements among founding countries of the ILRSCO before the end of 2024.”).

107. See Andrew Jones, *South Africa Joins China’s Moon Base Project*, SPACENEWS (Sept. 7, 2023), <https://spacenews.com/south-africa-joins-chinas-moon-base-project/> [<https://perma.cc/LGH7-FSRJ>] (noting that nanoSPACE AG, International Lunar Observatory Association, Asia-Pacific Space Cooperation Organization, Pakistan, Venezuela, South Africa all have signed on or intending to sign on).

108. *Id.* (While the ILRS was jointly presented by Russia and China, “Beijing has however since apparently taken the role of lead of the project[.]”).

109. *China Space Policy*, *supra* note 93, at Section VI.3(4).

110. *Id.* at Section VI.3.

offer a glimpse into how ILRSCO could potentially approach principles pertaining to ownership rights, non-interference policies, and environmental conservation in the context of lunar mining activities.

Although China does not explicitly assert that space resources can be owned, China states that it will be an active participant of discussions surrounding the “development and utilization of space resources.”<sup>111</sup> Furthermore, China emphasizes that such endeavors will be approached prudently, ensuring effective measures are taken to safeguard the Outer Space environment.<sup>112</sup> By highlighting its intention to utilize and develop space resources, China indirectly implies that entities might achieve a form of stewardship right over these resources. Therefore, even in the absence of explicit statements about ownership, similar to the Artemis Accords,<sup>113</sup> China appears poised to position the ILRSCO so that its members might acquire ownership rights, such as “use rights,” over space resources.

In the pursuit of lunar resources, it is probable that China will advocate for the ILRSCO to uphold a non-interference policy. In its white paper, China expresses its commitment to “cooperate in space environment governance” and to engage in “dialogue with Russia, the United States and other countries” on this topic.<sup>114</sup> This statement suggests China will embed within the ILRSCO certain guiding principles that will prohibit activities that can cause conflicts or harmful interference. The ILRSCO will also likely have mechanisms that could swiftly resolve disputes when they do arise. These policies would align with China’s goal of improving the “space crisis management and comprehensive governance [structure].”<sup>115</sup>

Furthermore, within its blueprint, China underscores the preservation of the Outer Space environment as a key area of cooperation. Specifically, China envisions being a part of a global community that works toward the “long-term sustainability of outer space activities.”<sup>116</sup> To further this goal, China also outlines its near-term internal aspirations to enhance “its space environment governance system.”<sup>117</sup> Given China’s dual focus on this issue—both domestically and internationally—it is likely that the China-driven ILRSCO will incorporate environmental directives into its founding charter.

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111. *Id.* at Section VI.3(1).

112. *Id.* at Section I.3.

113. *Id.* at Section II.B.1.

114. *Id.* at Section V.3(1).

115. *Id.*

116. *Id.*

117. *Id.* at Section II.7.

Thus, any lunar mining endeavors undertaken by ILRSCO's members would almost certainly have to take into account environmental stewardship.

Given that the ILRSCO is poised to adopt principles surrounding lunar resource rights, non-interference policies, and environmental protection, this multinational alliance could substantially influence lunar mining practices. Although the specifics of the ILRSCO's governance charter have not been publicly released, the ILRSCO will likely have some parallels to and distinctions with the Artemis Accords. As nations gravitate towards one of these two alliances<sup>118</sup>—championed by the frontrunners of this new space race—it is becoming clear that the China-driven ILRSCO could emerge as a compelling counterpoint to the United States-spearheaded Artemis Accords.

But it is important to note that Nation-States are not the only entities influencing this domain; non-governmental organizations are also playing a crucial role in transforming lunar governance. The next section will explore one leading example: the Moon Village Association.

### 3. Moon Village Association's Principles

Amid the prospects of the Moon becoming humanity's first extraterrestrial settlement,<sup>119</sup> non-governmental organizations are also contributing to the development of lunar governance principles. One prominent example is the Moon Village Association. Established in 2017 and headquartered in Vienna, Austria, the Moon Village Association seeks to become a collaborative platform for all stakeholders interested in humanity's development of Earth's sole natural satellite.<sup>120</sup>

One of the association's fundamental beliefs is that the creation of a "Moon Village" will encourage worldwide cooperation in lunar exploration

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118. See Mike Wall, *Not Just Artemis: China and Russia Plan To Put Boots on the Moon, Too*, SPACE.COM (Sept. 3, 2022), <https://www.space.com/china-russia-moon-base-ilrs> [<https://perma.cc/72WJ-ADU6>] (noting that the ILRS could be a competing alliance to the Artemis Accords); see also @Gessler555, *Competitive Colonization of the Moon: Artemis Accords & ILRSCO*, REDDIT (June 2023), [https://www.reddit.com/r/space/comments/14im249/competitive\\_colonization\\_of\\_the\\_moon\\_artemis/](https://www.reddit.com/r/space/comments/14im249/competitive_colonization_of_the_moon_artemis/) (containing a graphic of countries who have signed on to either alliance).

119. See Li, *supra* note 16 ("A functional Moon base will facilitate our exploration of Mars and beyond.").

120. *About*, MOON VILL. ASS'N, <https://moonvillageassociation.org/about/> [<https://perma.cc/ZL6Q-96QB>].

and settlement.<sup>121</sup> While not a literal city on the Moon, the Moon Village will be made up of various lunar-related exploration and research projects spanning across diverse fields of study—including economics, culture, science, and law—operating under common standards and best practices.<sup>122</sup>

To realize this objective, the Moon Village Association has developed a set of principles that will promote the “long-term sustainability of lunar and cislunar activity.”<sup>123</sup> Initially released in December 2018 and later updated in February 2020,<sup>124</sup> the Moon Village Association’s fifteen principles establish practical guidelines for lunar activities.<sup>125</sup> This document was drafted not only to align with various Nation-States’ obligations under international treaties but also extends these obligations to private actors as well.<sup>126</sup>

Although the principles do not carry the force of enforceable laws, they represent a “bottom-up approach” that encourages voluntary participation.<sup>127</sup> Through such adoption, the Moon Village Association hopes that these principles will eventually be enacted into soft and hard laws.<sup>128</sup> Therefore, although these principles may initially be seen as “a nonbinding voluntary initiative,” they could evolve into the basis for future customary Outer Space laws.<sup>129</sup> Consequently, these principles could eventually be applicable to a wide range of legal issues surrounding lunar mining activities.

Highlighting the crucial role that property rights can play in the development of lunar activities, the Moon Village Principles proposes a land use registry for the Moon.<sup>130</sup> It contemplates the United Nations as the overseeing body.<sup>131</sup> Before conducting any lunar activities, an entity would

121. *Moon Village Implementation*, MOON VILL. ASS’N, <https://moonvillageassociation.org/about/moon-village-implementation/> [https://perma.cc/U5N4-XUFE].

122. *Id.*

123. Giuseppe Reibaldi & Mark J. Sundahl, *Draft Moon Village Association Principles: Creating Best Practices for Sustainable Lunar Activities*, THE SPACE REV. (Apr. 27, 2020), <https://www.thespacereview.com/article/3929/1> [https://perma.cc/25PS-5TPX].

124. MOON VILL. ASS’N, MOON VILLAGE PRINCIPLES 1 (2020), <https://moonvillageassociation.org/wp-content/uploads/2020/03/MV-PRINCIPLES-Issue-2-Draft.pdf> [https://perma.cc/97WQ-KXM6].

125. See Masson-Zwaan & Sundahl, *supra* note 36, at 52.

126. *Id.*

127. *Id.* at 82.

128. MOON VILL. ASS’N, *supra* note 124, at 4.

129. Sundahl, *supra* note 36, at 82; see also Masson-Zwaan & Sundahl, *supra* note 36, at 52–53 (explaining that these principles are voluntary but may evolve in step with the development of lunar activity).

130. MOON VILL. ASS’N, *supra* note 124, at 4.

131. *Id.*

register its proposed activities in this database, providing details on the type, location, and duration of the planned activities.<sup>132</sup> Although the Moon Village Principles' authors acknowledge the potential contentious nature of this system, they believe this registry is indispensable in preventing lunar conflicts by effectively putting "the world on notice."<sup>133</sup> Since one of the core tenets of land rights is the right to exclude,<sup>134</sup> the Moon Village Principles essentially safeguards one's ability to mine on the Moon through a priority and exclusionary registration system. Thus, if the Moon Village Principles gains popular traction, it can provide legal cover for lunar mining activities.

However, similar to other governing documents, the Moon Village Principles establishes certain limitations through its non-interference principle. Once a lunar activity has been registered, all other parties must recognize and ensure that their activities do not harmfully interfere with the registered activity.<sup>135</sup> In addition, "appropriate consultations" are required to facilitate cooperation among parties;<sup>136</sup> this means that if a party's lunar mining activities could potentially interfere with other registered activities, the parties need to discuss a path forward so that the activities do not harmfully impact one another.

Emphasizing the need for environmental preservation, the Moon Village Principles includes a principle devoted to environmental and cultural protection. This principle requires all parties to take "appropriate measure to avoid" causing harm to the Moon and its surrounding area, as well as disrupting any sites of historic or scientific significance.<sup>137</sup> Therefore, a lunar mining company would need to carefully consider where and how it conducts its resource extraction activities. It is possible that despite locating a resource-rich area and registering its intent to conduct mining activities, if that area holds scientific or historic importance, the entity could still be forbidden from carrying out its resource extraction operations.

Similar to its governmental counterparts, the non-governmental Moon Village Principles seems to legally uphold the right to lunar mining. But it does impose certain restrictions on such activities through its principles of non-interference and environmental protection. These themes are not exclusive to the Moon Village Principles; indeed, these same concepts are

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132. *Id.*

133. Sundahl, *supra* note 36, at 81–82.

134. *See* Grace, *supra* note 34 (noting that the "right of exclusion" is one of the five essential rights of property ownership).

135. MOON VILL. ASS'N, *supra* note 124, at 4.

136. *Id.* at 2.

137. *Id.* at 3.

echoed in another influential white paper that inspired the Moon Village Principles. That document is the Building Blocks for the Development of an International Framework on Space Resource Activities. The subsequent section will delve into this policy document and how it addresses activities related to Outer Space resources.

#### 4. The Hague International Space Resources' Building Blocks

In 2014, amidst an environment lacking clear legal guidelines on the use and development of space resources, the Hague Institute for Global Justice convened a panel of experts to devise a solution.<sup>138</sup> As an outcome of that conference, the Hague International Space Resources Governance Working Group was established in 2015 and tasked with forming a legal framework that can govern space resources.<sup>139</sup> Following extensive discussions, this group accomplished this goal in 2019 by publishing its policy document: Building Blocks for the Development of an International Framework on Space Resource Activities, more commonly known as the Building Blocks.<sup>140</sup>

Comprised of twenty provisions,<sup>141</sup> the Building Blocks represent a significant policy document addressing various aspects related to space resources.<sup>142</sup> Despite just being a few years old, these policies are already influencing the subsequent discourse on this topic.<sup>143</sup> Furthermore, these guidelines implicitly and explicitly establish several legal principles—including those related to property rights, non-interference, and environmental protection—surrounding Outer Space mining operations.<sup>144</sup>

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138. BUILDING BLOCKS FOR THE DEVELOPMENT OF AN INTERNATIONAL FRAMEWORK FOR THE GOVERNANCE OF SPACE RESOURCE ACTIVITIES: A COMMENTARY 1 (Olavo de O. Bittencourt Neto et al. eds., 2020) [hereinafter BUILDING BLOCKS COMMENTARY], <https://boeken.rechtsgebieden.boomportaal.nl/publicaties/9789462361218#152> [<https://perma.cc/GYZ6-2VHP>].

139. *Id.*

140. *Id.* at 3–5.

141. THE HAGUE INT'L SPACE RES. GOVERNANCE WORKING GRP., BUILDING BLOCKS FOR THE DEVELOPMENT OF AN INTERNATIONAL FRAMEWORK FOR THE GOVERNANCE OF SPACE RESOURCE ACTIVITIES (Nov. 12, 2019) [hereinafter BUILDING BLOCKS], <https://www.universiteitleiden.nl/binaries/content/assets/rechtsgeleerdheid/instituut-voor-publiekrecht/lucht--en-ruimterecht/space-resources/final-bb.pdf> [<https://perma.cc/2KJY-TEHS>].

142. Masson-Zwaan & Sundahl, *supra* note 36, at 44 (indicating that while it is a nascent document, the Building Blocks have already “influenced subsequent initiatives that further develop their content”).

143. *Id.*; *see, e.g.*, discussion *supra* Section II.B.3.

144. *See* Masson-Zwaan & Sundahl, *supra* note 36, at 43 (“The Building Blocks include technical, legal, scientific, industrial, business and social perspectives . . . .” (emphasis added)).

Additionally, in drafting the Building Blocks, the authors also ensured that its policies comply with existing international laws related to Outer Space activities, especially the United Nations Treaties on Outer Space.<sup>145</sup>

While the Outer Space Treaty asserts that Outer Space cannot be appropriated by any entity,<sup>146</sup> the Building Blocks circumvent this restriction by proposing the concept of “priority rights.”<sup>147</sup> Under this system, an entity that is intending to extract space resources would register its planned activities in an international registry.<sup>148</sup> Once registered, this information would be housed in a publicly-accessible database.<sup>149</sup> Through this process, the entity could essentially acquire a temporary license to perform such operations over the area specified.<sup>150</sup> Given that this provision targets all Outer Space resources, this “priority rights” concept would be applicable to lunar mining activities as well. By allowing an entity to claim a specific area of Outer Space in a manner that is time-limited and contingent on a registration process, the Building Blocks strike a compromise: one that is balanced between the need to offer exclusive property rights vital for mining operations and a process that aligns with existing international Outer Space laws.<sup>151</sup>

However, the Building Blocks do impose certain soft conditions on the grant of such priority rights to an entity. Specifically, the guidelines strongly encourage all space mining enterprises to share any benefits derived from the use of such space resources, particularly with non-spacefaring nations.<sup>152</sup> However, the Blocking Blocks emphasize that this is not a mandatory condition and do not require the sharing of any monetary revenues.<sup>153</sup> What the Building Blocks’ authors envisioned with this policy is essentially the Moon Agreement’s “Enterprise” concept;<sup>154</sup> they wanted to ensure that all

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145. See BUILDING BLOCKS COMMENTARY, *supra* note 138, at 18 (“Indeed, the rapport between space resource activities and the space law instruments and rules . . . is to be understood . . . so as to identify the applicable legal principles and ensure compliance therewith.”).

146. See discussion *supra* Section II.A.aa.1.

147. BUILDING BLOCKS, *supra* note 141, § 7.

148. *Id.* §§ 7, 14.

149. *Id.* § 18.

150. See *id.* § 8.

151. BUILDING BLOCKS COMMENTARY, *supra* note 138, at 46–47.

152. BUILDING BLOCKS, *supra* note 141, § 13.1.

153. *Id.* § 13.2.

154. Li, *supra* note 25, at 722 (indicating that the Moon Agreement promotes a concept that is similar to the Enterprise system from the Law of the Sea in which all nations will have an equitable share of the benefits).

entities can reap general benefits in terms of technological advancement or scientific knowledge that result from these space resources.<sup>155</sup>

Fostering cooperation in Outer Space, the Building Blocks also uphold the principle of non-harmful interference as related to space mining activities. For example, if an entity is drilling on the Moon, it must ensure that its activities are performed with “due regard” to the “corresponding interests of all countries and humankind.”<sup>156</sup> In the Building Blocks’ commentary, “due regard” is defined as ensuring that an entity’s activities do not interfere with other entities performing the same type of activities.<sup>157</sup> This ensures a level playing field and that all entities are operating in Outer Space with mutually-respectful conduct.

The Building Blocks also protect the operations of an entity conducting lunar mining activities from interference by others. Specifically, the Building Blocks propose the creation of safety zones around an entity’s planned mining areas so that its space mining activities can proceed without impediments.<sup>158</sup> While these safety zones are not meant to act as exclusionary zones by default, temporary access restrictions can be implemented “to assure safety and to avoid any harmful interference.”<sup>159</sup> However, the entity requesting such access exclusion must first make a public and timely notification.<sup>160</sup> To comply with the non-appropriation principle, the Building Blocks suggest that a framework should be established so that the creation of these safety zones and the restrictions therein must be carefully evaluated.<sup>161</sup> Acknowledging that overlapping safety zones could create potential conflicts, the Building Blocks encourage coordination and consultations to implement this non-interference policy effectively.<sup>162</sup>

The Building Blocks are also committed to the prevention of “harmful impact” in Outer Space.<sup>163</sup> Although what constitutes a “harmful impact” is not strictly defined and left open for future interpretation,<sup>164</sup> the policies do

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155. BUILDING BLOCKS, *supra* note 141, § 13.3.

156. *Id.* § 9.

157. See BUILDING BLOCKS COMMENTARY, *supra* note 138, at 57 (“In relation to the term ‘due regard,’ [it is] defined [as] the obligation of States, when exercising their freedoms, to consider the interest of other States and refrain from interfering with other States exercising the same freedoms.”).

158. BUILDING BLOCKS, *supra* note 141, § 11.3.

159. *Id.*

160. *Id.*

161. BUILDING BLOCKS COMMENTARY, *supra* note 138, at 66.

162. BUILDING BLOCKS, *supra* note 141, § 11.4.

163. *Id.* § 10(d)–(e).

164. BUILDING BLOCKS COMMENTARY, *supra* note 138, at 71.

acknowledge certain specific concerns. For instance, “biocontamination” is regarded as a type of harmful environmental impact.<sup>165</sup> This could occur if mining operations inadvertently introduce Earth-based microbes to the lunar surface. Furthermore, the creation of space debris is identified as another form of harmful impact.<sup>166</sup> As mining operations advance, they could potentially generate debris that would pose a hazard to both lunar personnel and equipment. Lastly, the Building Blocks indicate that the preservation of sites of cultural and scientific importance is a crucial aspect of environmental protection as well.<sup>167</sup> This could include sites where past lunar missions have landed, left equipment, or conducted experiments. Therefore, any mining operations should be planned and conducted in a way that does not harm these areas of cultural and scientific interest.

To achieve the desired environmental goals, the Building Blocks advocate for the completion of an environmental impact assessment prior to the commencement of any space mining operations.<sup>168</sup> After receiving the necessary approval, the operating entity should establish and maintain procedures, methodologies, and technical standards that ensure such activities will avoid harmful impact.<sup>169</sup> This entails the implementation of continuous monitoring mechanisms capable of identifying potential environmental harm during the course of the operations.<sup>170</sup> In the event a harmful impact or interference is detected, the Building Blocks mandate an “adaptive management” approach that enables the adjustment or termination of the activities causing such disruption.<sup>171</sup>

The principles set forth in the Building Blocks, like those in the other Alliance-based agreements, have significant implications for any entity involved in lunar mining operations. These Alliance-based agreements all contain property rights that would bolster the legal status of lunar mining. However, principles such as non-interference and environmental protection within these agreements indicate that such lunar mining rights are not unfettered. Thus, these Alliance-based agreements strike a balance between adherence to the spirit of United Nations Treaties on Outer Space and the promotion of lunar mining operations. In this respect, these frameworks

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165. *Id.*

166. BUILDING BLOCKS, *supra* note 141, § 10(f).

167. *Id.* § 10(h)–(i).

168. *Id.* § 11.1.

169. *Id.* § 11.2.

170. *Id.* § 12.1.

171. *Id.* § 12.2.

represent a significant stride towards establishing the legitimacy of a lunar mining industry.

But as the new space age progresses and more nations develop space-faring capabilities, several nations are also independently considering ways to foster their own commercial space endeavors. Consequently, national legislations addressing commercial space activities are also emerging. Some of these policies specifically address activities related to Outer Space resources. The following section will explore how these national Outer Space laws might legally affect lunar resource extraction activities.

### C. Country-Specific Regulations

As a renewed public interest fuels the emergence of a new space age,<sup>172</sup> it is becoming clear that—unlike the first space age—commercial entities will play a significant role in developing the new space economy.<sup>173</sup> In response to these private enterprises' potential impact, many countries are updating their Outer Space laws; this is done to ensure that their commercial space industry will align with such nations' Outer Space policies and international obligations. Because space mining is likely to be a key activity for some of these commercial space enterprises,<sup>174</sup> several of these recently-enacted national space laws have sought to clarify the legal uncertainties surrounding space resources—especially in the areas of property ownership, non-interference policy, and environmental protection. This section will explore the four countries that have enacted commercial space laws that cover space resources: (1) United States, (2) Luxembourg, (3) United Arab Emirates, and (4) Japan.

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172. See, e.g., Ben Lamm, *What 'Branding' in This Age of Renewed Interest in Space Means for Entrepreneurs*, ENTREPRENEUR (Feb. 18, 2019), <https://www.entrepreneur.com/leadership/what-branding-in-this-age-of-renewed-interest-in-space/327779> [<https://perma.cc/CMH5-6VGG>] (“Today, we are entering a renewed and re-energized era of space exploration and commercialization . . .”).

173. See Matthew Weinzierl & Mehak Sarang, *The Commercial Space Age Is Here*, HARV. BUS. REV. (Feb. 12, 2021), <https://hbr.org/2021/02/the-commercial-space-age-is-here> [<https://perma.cc/5K7H-BDPP>] (“In our recent research, we examined how the model of centralized, government-directed human space activity born in the 1960s has, over the last two decades, made way for a new model, in which public initiatives in space increasingly share the stage with private priorities.”).

174. See generally *id.* (“In other words, when people are living and working in space, we are likely to look back on these early asteroid mining companies less as failures and more as simply ahead of their time.”).

## 1. United States

In 2015, the United States became the first nation to formally enact laws regarding the use of space resources. With the U.S. Commercial Space Launch Competitiveness Act of 2015 (“U.S. Space Act of 2015”),<sup>175</sup> the United States proclaimed that its citizens, or entities controlled or owned by its citizens, can fully utilize any space resources they “obtained in accordance with applicable laws, including the international obligations of the United States.”<sup>176</sup> Through this declaration, the United States asserted its belief that the ownership of space resources does not contradict the Outer Space Treaty’s non-appropriation principle, an “international obligation” that binds the United States.<sup>177</sup> To underscore this point, this law explicitly states that the U.S. Space Act of 2015 “does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body.”<sup>178</sup> Subsequently, an executive order<sup>179</sup> reinforced this position and further explicitly rejected the “equitable warehouse” principle<sup>180</sup> outlined in the Moon Agreement. Given that the United States has not signed the Moon Agreement and the treaty does not have widespread adoption, the executive order essentially dismissed the Moon Agreement’s international legitimacy.<sup>181</sup> Thus, America’s official policy is that space resources are a form of property that can be fully owned and utilized.

By focusing on the ownership of the space resource itself rather than the location from where it is extracted, the U.S. Space Act of 2015 circumvents any potential issues with the non-appropriation principle. This approach to space mining parallels the Law of the Sea’s approach to fishing activities in international waters.<sup>182</sup> According to the United Nations Convention on the Law of the Sea (“Law of the Sea”),<sup>183</sup> no country can assert a claim of sovereignty over any portion of international waters.<sup>184</sup> However, all

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175. United States Commercial Space Launch Competitiveness Act of 2015, Pub. L. 114-90, 129 Stat. 704 (codified as amended at 51 U.S.C. § 51303) [hereinafter Space Act].

176. *Id.* § 51303.

177. *See* discussion *supra* Section II.A.1.

178. § 51303.

179. Exec. Order No. 13914, 3 Fed. Reg. 20381 (Apr. 6, 2020).

180. *See* discussion *supra* Section II.A.2.

181. Exec. Order No. 13914, 3 Fed. Reg. at 20381 (Apr. 6, 2020).

182. Frans G. von der Dunk, *Asteroid Mining: International and National Legal Aspects*, 26 MICH. ST. INT’L L. REV. 83, 93 (2017).

183. U.N. Convention on the Law of the Sea, *opened for signature* Dec. 10, 1982, 1833 U.N.T.S. 397 (entered into force Nov. 16, 1994).

184. *Id.* art. 89.

countries are granted a mostly unconditional right to fish in these high seas.<sup>185</sup> The U.S. Space Act of 2015 essentially applies this rationale to resource extraction in Outer Space. Much like international waters, Outer Space cannot be appropriated; but fishing is still allowed in these high seas. With space mining being the Outer Space's equivalent of high seas fishing, the United States likely thought that the widely-accepted Law of the Sea's principle could naturally import over and garner international acceptance.

But just as fishing rights in international waters come with conditions, mining rights in Outer Space, including on the Moon, would be similarly regulated. Under the Law of the Sea, while all entities are entitled to fish in international waters, they must conduct such activities "with due regard for the interests of other States in their exercise of the freedom of the high seas."<sup>186</sup> Although the U.S. Space Act of 2015 does not explicitly place any limitations on resource mining in Outer Space, implicit restrictions are incorporated. Specifically, this law stipulates that the mining rights granted to United States citizens must comply with the "international obligations of United States."<sup>187</sup>

Even though the United States is not a party to the Moon Agreement, it is a signatory to the other United Nations Treaties on Outer Space, including the seminal Outer Space Treaty.<sup>188</sup> Under the Outer Space Treaty, all entities must ensure that their Outer Space activities do not interfere with activities of others in this domain.<sup>189</sup> Therefore, this condition applies to any rights granted under the U.S. Space Act of 2015. Thus, while United States citizens have the right to lunar mining, they are duty-bound under the non-interference principle to consider the activities of others while conducting such mineral extraction activities.

But on the receiving end of the non-interference principle, the U.S. Space Act of 2015 also explicitly safeguards American citizens' space mining activities from disruption by others. The legislation mandates the President to ensure these operations can be carried out "free from harmful interference."<sup>190</sup> This is different from earlier drafts of the law where a "*first in time is first in right*" system was established for enforcing the non-

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185. *Id.* art. 87(1)(e).

186. *Id.* art. 87(2).

187. 51 U.S.C. § 51303.

188. *See* discussion *supra* Section II.A.1.

189. *Id.*

190. § 51302(a)(3).

interference policy;<sup>191</sup> Congress eventually removed this mechanism, entrusting the federal government to address potential conflicts through its existing licensing structure.<sup>192</sup> Nevertheless, by defending mining rights against intrusion by others, the law might inadvertently spur a hasty race to the Moon; even if their processes and technologies are not fully developed, companies may be motivated to promptly lay claims on resource-rich areas to prevent others from accessing the same regions.

Given that the U.S. Space Act of 2015 incorporates the international obligations of the United States, the mining rights conferred to American citizens under this law will also be bound by environmental considerations. Specifically, the Outer Space Treaty requires all entities to ensure their activities do not harmfully contaminate Outer Space.<sup>193</sup> As the United States has ratified this treaty, this requirement is also a restriction on the mining rights granted under the U.S. Space Act of 2015. This implies that American mining companies may be required to conduct environmental impact assessments prior to starting their resource extraction projects. The outcomes of these assessments could lead to certain limitations on their lunar mining operations.

With the U.S. Space Act of 2015, the United States establishes the legal position that space mining, including lunar resource extraction, is both permissible under and compatible with existing international Outer Space laws. Nonetheless, these rights to resource extraction are not absolute as they may be subject to certain international principles such as non-interference and environmental preservation. But despite these limitations, through the U.S. Space Act of 2015, the United States—as one of the major spacefaring powers—took a pioneering step in shaping the legal regime surrounding lunar resource extraction.

Prompted by this action, other countries quickly followed suit. The subsequent section will explore the next country to formalize its stance on lunar mining: Luxembourg.

## 2. Luxembourg

Two years after the passage of the U.S. Space Act of 2015, Luxembourg emerged as the second nation to formally address the topic of space resources

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191. See Masson-Zwaan & Sundhal, *supra* note 36, at 38 (indicating that the initial version sets up a claim court for issuing ruling in favorite of those who were first).

192. § 51303.

193. See discussion *supra* Section II.A.1.

by implementing the Law of July 20th 2017 on the Exploration and Use of Space Resources (“Luxembourg Space Resources Law”).<sup>194</sup> This law was primarily enacted to uphold the country’s compliance with Article VI of the Outer Space Treaty.<sup>195</sup> Under this article, every State-party to the treaty must supervise and authorize all Outer Space activities undertaken by its “non-governmental entities.”<sup>196</sup> Thus, the Luxembourg Space Resources Law is a critical component of Luxembourg’s commercial space framework. Under this legislation, the Luxembourg Ministry of the Economy is assigned the role of supervising authority for all Luxembourg-authorized commercial space activities, including lunar mining.<sup>197</sup>

On the ownership of space resources, the Luxembourg Space Resources Law not only aligns with United States’ stance but also expands on it. First, Luxembourg affirms the position that space resources can be owned.<sup>198</sup> It then offers these ownership rights to entities beyond its own citizens. Rather than putting an emphasis on citizenship, the Luxembourg Space Resources Law focuses on the corporate structure; any entity incorporated in Luxembourg, or a European entity with its headquarters in Luxembourg, can be authorized “for a mission of exploration and use of space resources for commercial purposes.”<sup>199</sup> Consequently, foreign individuals may be granted ownership rights to lunar resources if their lunar mining entity is registered in Luxembourg.

To acquire ownership rights, individuals simply need to submit a thorough application for the proposed activities and gain approval from the Ministry of the Economy.<sup>200</sup> However, the Luxembourg Space Resources Law does impose certain limitations on these rights. For instance, an entity will lose its authorization if it fails to execute the planned activities within three years of their approval or if it ceases commercial activities related to space resources for a period of six months or more.<sup>201</sup>

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194. Loi A674 du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace [Law A674 of July 20, 2017 on the Exploration and Use of Space Resources] (Fr.), *translated in* 7093 J. OFFICIEL DU GRANDDUCHÉ DE LUXEMBOURG, July 28, 2017 [hereinafter Luxembourg Law], <https://legilux.public.lu/eli/etat/leg/loi/2017/07/20/a674/jo/en> [<https://perma.cc/YM3X-AJT7>].

195. *Legal Framework*, LUXEMBOURG SPACE AGENCY Mar. 2, 2022, <https://space-agency.public.lu/en/agency/legal-framework.html> [<https://perma.cc/EDB6-9FZB>].

196. Outer Space Treaty, *supra* note 27, art. VI.

197. Luxembourg Law, *supra* note 194, art. 2(1).

198. *Id.* art. 1.

199. *Id.* arts. 3–4.

200. *Id.* arts. 3, 6–7.

201. *Id.* art. 14(2).

Like the U.S. Space Act of 2015, the Luxembourg Space Resources Law also factors in Luxembourg's international obligations.<sup>202</sup> Similar to the United States, Luxembourg has also ratified the Outer Space Treaty.<sup>203</sup> Thus, the mining rights granted by Luxembourg will be subject to the principles of non-interference and environmental protection stipulated in the Outer Space Treaty.

In addition, the Luxembourg Space Resources Law indirectly embeds these principles within its provisions as well. The law mandates that all entities intending to extract space resources must first carry out a risk assessment as a part of the application for their proposed activities.<sup>204</sup> Moreover, these entities bear full liability for any damages that their activities might cause.<sup>205</sup> Given the potential repercussions, it is likely that a lunar mining company will comprehensively analyze the impact its operations might have on the activities of others on the Moon, as well as potential environmental damage to the Moon itself.

Additionally, under the Outer Space Treaty, Luxembourg would be "internationally responsible" for its national activities in Outer Space and would be "internationally liable" for any damages caused to another State-party to the treaty.<sup>206</sup> Thus, Luxembourg's Ministry of the Economy will likely exhibit caution and thoroughness in reviewing and approving Outer Space mining applications. When considering a lunar mining application, the Ministry will probably take into account the potential for these activities to cause interference, as well as their environmental impact to the lunar environment. Hence, the principles of non-interference and environmental protection will likely be operationally considered during the application process.

Through the Luxembourg Space Resources Law, Luxembourg took a bold step as the second nation to officially legalize mining activities in Outer Space. Furthermore, it augmented the position established by the United States, offering any entity headquartered or incorporated in Luxembourg the right to claim ownership over space resources. Similar to their treatment under the U.S. Space Act of 2015, these Outer Space mining rights are also constrained by Luxembourg's international obligations such as the Outer Space Treaty's principles of non-interference and environmental protection.

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202. *Id.* art. 2(3).

203. U.N. TREATIES STATUS, *supra* note 31, at 8.

204. Luxembourg Law, *supra* note 194, art. 10(1).

205. *Id.* art. 16.

206. Outer Space Treaty, *supra* note 27, arts. VI–VII.

With countries in two different regions of the world formally adopting legal positions on lunar mining activities, other parts of the world did not wish to lag behind. Two years later, the baton was passed to the Middle East via the United Arab Emirates. The next section will explore this country's stance on space resources.

### 3. United Arab Emirates

While the United Arab Emirates (“UAE”) launched its inaugural Outer Space probe only after the turn of this millennium,<sup>207</sup> the country has since made swift strides in the development of its space program—even ascending to the status of a major spacefaring nation. Within the past decade, the UAE has formally established a national space agency,<sup>208</sup> sent a citizen into Outer Space,<sup>209</sup> and successfully inserted a probe into Mars’ orbit.<sup>210</sup> The UAE perceives its burgeoning space program as a way to future-proof its national prosperity, particularly when it may no longer depend on its petroleum reserves as its primary revenue generator.<sup>211</sup> Given that the country’s rise in stature could be largely attributed to resource extraction and utilization, the UAE naturally sought to be at the forefront of policy and regulatory developments related to Outer Space resources. Indeed, when the UAE enacted national laws governing its Outer Space sector in 2019 (“UAE Space Law”),<sup>212</sup> it included several provisions that directly address Outer Space resources and related activities.

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207. P.J. Blount & Mohamed Amara, *SPARC Brief: United Arab Emirates*, U. WASH. SPACE POL’Y & RSCH. CTR. (Aug. 2020), <https://www.sparc.uw.edu/uae/> [<https://perma.cc/9957-YMJS>].

208. *About UAE Space Agency*, UAE SPACE AGENCY, <https://space.gov.ae/Page/20120/20230/About-UAE-Space-Agency> [<https://perma.cc/FV2S-RQ98>].

209. Kenneth Chang, *Hazzaa al-Mansoori, First U.A.E. Astronaut, Launches to Space Station*, N.Y. TIMES (July 19, 2020), <https://www.nytimes.com/2019/09/25/science/emirati-astronaut-uae-international-space-station.html> [<https://perma.cc/CXG2-X69R>].

210. Alex S. Li, *2020: A Mars Odyssey*, #THESPACEBAR (Sept. 22, 2020), <https://alexli.com/thespacebar/2020/9/22/2020-a-mars-odyssey> [<https://perma.cc/6SAK-NY6C>].

211. Kate Greene, *Why the United Arab Emirates Is Building a Space Program from Scratch*, SLATE (Mar. 30, 2017), <https://slate.com/technology/2017/03/why-the-united-arab-emirates-is-building-a-space-program.html> [<https://perma.cc/G8LD-XCQE>].

212. Federal Law No. (12) of 2019 on the Regulation of the Space Sector (Dec. 12, 2019) [U.A.E.] [hereinafter UAE Law], <https://www.moj.gov.ae/assets/2020/Federal%20Law%20No%2012%20of%202019%20on%20THE%20REGULATION%20OF%20THE%20SPACE%20SECTOR.pdf.aspx> [<https://perma.cc/VPD4-UE9K>].

While the UAE Space Law itself does not overtly state that space resources can be legally owned, it does so indirectly. Specifically, the law states that activities related to space resources can be regulated by the national government and its representatives,<sup>213</sup> such as its space agency. Then, in a 2023 interpretive regulatory framework to the UAE Space Law, the UAE Space Agency states that space resources can be owned by “Operators” authorized by the agency.<sup>214</sup> These regulations define these “Operators” as any UAE citizens, entities headquartered within the UAE’s borders, or foreign entities with a subsidiary in the UAE.<sup>215</sup> For these entities, as long as their mining activities are authorized by the UAE Space Agency, they would receive the typical ownership rights associated with such space resources.<sup>216</sup>

But like the countries before it, the UAE also ensures that these ownership rights are in line with its international obligations. The UAE also does this indirectly through its space agency’s interpretive regulations. Notably, the regulations state that the UAE’s grant of ownership rights to space resources must not be “prejudice to [the UAE’s] international obligations.”<sup>217</sup> With the UAE having joined four of the five United Nations Treaties on Outer Space,<sup>218</sup> all of its obligations in those treaties would then carry over into its space resources laws. This would include the Outer Space Treaty’s provisions on non-interference and environmental protection.<sup>219</sup>

In support of these goals in Outer Space, the regulations also have very detailed provisions that could help to prevent interference and protect the environment. In granting an authorization for mining activities, the regulations again dictate that the UAE Space Agency must consider UAE’s “international legal obligations.”<sup>220</sup> The provision then clearly notes that this would include an evaluation of the environmental impact of such activities.<sup>221</sup> In addition, the UAE Space Agency should also consider whether such

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213. *Id.* arts. 4(i)–(j),18.

214. Space Resources Regulation: Regulatory Framework on Space Activities of the United Arab Emirates [U.A.E.] art. 7(1) [hereinafter UAE Regulations], <https://space.gov.ae/Documents/PublicationPDFFiles/POLREG/SpaceResources-EN.pdf> [<https://perma.cc/R39C-CMDX>].

215. *Id.* art. 2.

216. *Id.* art. 7(2).

217. *Id.* art. 7(1).

218. The UAE has joined all but the Moon Agreement. U.N. TREATIES STATUS, *supra* note 31, at 11.

219. *See* discussion *supra* Section II.A.1.

220. UAE Regulations, *supra* note 214, art. 5(1).

221. *Id.* art. 5(2).

activities will interfere with the activities of other States.<sup>222</sup> If such interference could occur, the UAE Space Agency must first consult with such other State prior to authorizing such activities.<sup>223</sup>

Additionally, even after such activities are authorized, the mining entity is still responsible for maintaining the principles of non-interference and environmental protection. In particular, each entity must immediately inform the UAE Space Agency if its activities cause any “unintentional interference or damages” to another country’s space objects as well as any “interference or unintentional damages to sites on the Moon . . . that hold historical significance.”<sup>224</sup>

Although the UAE Space Law does not explicitly affirm the ownership of space resources, it does so implicitly via its space agency’s interpretative regulations. Furthermore, while the principles of non-interference and environmental protection are also not explicitly interwoven into the UAE Space Law, they are incorporated implicitly via these regulations as well. Therefore, the UAE’s legal position on lunar mining aligns with that of United States and Luxembourg: that these operations are legally permissible with certain constraints.

With three countries setting a new legal paradigm concerning the legality of lunar resource mining, other countries were prepared to follow suit. The only question was who’s next? The answer came quickly when just two years later, Japan stepped into the spotlight. The subsequent section will examine Japan’s approach towards space resource activities.

#### 4. Japan

On June 15, 2021, Japan published its official stance on Outer Space resources and related activities through the enactment of the Act on the Promotion of Business Activities for the Exploration and Development of Space Resources—Act No. 83 of 2021 (“Japanese Space Resources Act”).<sup>225</sup> Through this law, Japan became the world’s fourth nation to formulate a

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222. *Id.* art. 5(3).

223. *Id.* art. 5(4).

224. *Id.* art. 14(4).

225. 宇宙資源の探査及び開発に関する事業活動の促進に関する法律 [Act on the Promotion of Business Activities for the Exploration and Development of Space Resources], Act No. 83 of 2021 (Japan) [hereinafter Japanese Law], [https://www8.cao.go.jp/space/english/resource/documents/act83\\_2021.pdf](https://www8.cao.go.jp/space/english/resource/documents/act83_2021.pdf) [<https://perma.cc/JA28-32NT>].

position on space resources.<sup>226</sup> Mirroring the explicitness of the U.S. Space Act of 2015 and the Luxembourg Space Resources Law, the Japanese Space Resources Act is forthright in its language concerning crucial legal issues such as ownership rights and the incorporation of its obligations under international Outer Space treaties.<sup>227</sup>

The Japanese Space Resources Act directly addresses the issue of ownership rights. This law unequivocally states that entities conducting Outer Space mining activities, in compliance with the Act's requirements, "shall acquire the ownership of space resources that [they] have mined."<sup>228</sup> This explicit declaration mirrors the approach taken by the U.S. Space Act of 2015 and the Luxembourg Space Resources Law, which both unambiguously and explicitly grant the ability to own space resources.<sup>229</sup>

In order to obtain these rights, an entity must include a comprehensive "business activity plan" in its application for a license to conduct space mining activities;<sup>230</sup> this plan must detail the purpose, duration, location, and methods of the proposed mining activities.<sup>231</sup> Upon submission, the application and its accompanying plan are then evaluated by the Office of the Prime Minister of Japan, with consultation from the Ministry of Economy, Trade and Industry, which shall ultimately decide whether to grant a mining license to that entity.<sup>232</sup>

Like the other countries, the Japanese Space Resources Act explicitly notes that the rights conferred by this mining license will be subject to Japan's international obligations.<sup>233</sup> This effectively integrates Japan's obligations under the Outer Space Treaty, such as the principles of non-interference and environmental protection, into its space resources law. Furthermore, in its permit review process, the Office of the Prime Minister is required to evaluate whether an entity's proposed mining operations will create adverse consequences for the "development and use of outer space."<sup>234</sup> Such evaluations will also likely take into account the Outer Space Treaty's

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226. *Japan: Space Resources Act Enacted*, LIBR. OF CONG., <https://www.loc.gov/item/global-legal-monitor/2021-09-15/japan-space-resources-act-enacted/> [<https://perma.cc/NQ8N-35HT>].

227. Japanese Law, *supra* note 225, art. 1.

228. *Id.* art. 5.

229. *See supra* Sections II.C.1–2.

230. Japanese Law, *supra* note 225, art. 3(1).

231. *Id.*

232. *Id.* art. 3(2)–(3).

233. Japanese Law, *supra* note 225, art. 6(1).

234. *Id.* art. 3(2)(i).

principles.<sup>235</sup> Thus, any mining rights conferred by the Japanese government under this Act—including a license for lunar mining—are not absolute. These rights are subject to the entity’s ability to ensure that its operations do not adversely affect the environment or interfere with the activities of others.

Additionally, on these principles of non-interference and environmental protection, the Japanese Space Resources Act also went a step further than the other nations’ space resources laws. This Act explicitly stipulates that its provisions must not “unjustly harm” the rights of other States in their “freedom of the exploration and use of Outer Space, including the Moon and other celestial bodies.”<sup>236</sup> Through this provision, the Japanese legislation essentially codifies the principles of non-interference and environmental protection directly into the Act, explicitly linking these restrictions to any space mining rights granted by Japan. Therefore, even in the unlikely scenario that these principles are excised from the Outer Space Treaty, Japan will continue to ensure that entities under its jurisdiction adhere to such principles.

With this law, Japan essentially primed its commercial space industry for lunar mining activities. In fact, just over a year following the Japanese Space Resources Act’s enactment, a Japanese-headquartered entity—iSpace, Inc.—procured a license for lunar mining activities.<sup>237</sup> In a NASA-affiliated mission, iSpace plans to extract certain lunar regolith.<sup>238</sup> As stipulated by the Japanese law, iSpace will possess legal ownership of these materials and intends to subsequently transfer ownership of the mined regolith to NASA.<sup>239</sup>

With the Outer Space mining industry projected to balloon into a \$100 trillion market,<sup>240</sup> iSpace’s lunar mining mission is likely a harbinger of things to come. As technologies continue to advance by leaps and bounds, a surge of both commercial and governmental entities is expected to stake their mining claims on Earth’s sole natural satellite in the forthcoming decades. Simultaneously, the Outer Space laws concerning mining on the Moon seem to be evolving to legitimize such activities; entities are empowered to own the lunar resources they extract, but with certain operational restrictions.

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235. See discussion *supra* Section II.A.1.

236. *Id.* art. 6(2).

237. *First License Granted Under Japan’s Space Resources Act*, ISPACE (Nov. 8, 2022), <https://ispace-inc.com/news-en/?p=3829> [<https://perma.cc/PZ3U-GPSP>].

238. *Id.*

239. *Id.*

240. Emily Calandrelli, *The Potential \$100 Trillion Market for Space Mining*, TECHCRUNCH (July 9, 2015), <https://techcrunch.com/2015/07/09/the-potential-100-trillion-market-for-space-mining> [<https://perma.cc/HF8V-6443>].

While this development aids the expansion of the Moon-mining industry, it is becoming evident that the lack of a universal regime that all entities can uniformly adhere to could cause confusion. Navigating through a fragmented array of laws and regulations—enacted by different alliances, non-governmental organizations, and independent nations—may result in a tumultuous lunar mining industry.

In light of this potential quagmire, the succeeding Part presents a solution: the establishment of an impartial, consensus-building central authority. Such an organization could effectively manage the triad of crucial legal issues underpinning lunar mining activities: ownership rights, non-interference policy, and environmental protection.

### III. RESOLVING LUNAR LEGAL DISCREPANCIES

As the legal landscape for lunar activities continues to evolve, the resulting medley of different legal regimes could foster confusion. As outlined in Part II,<sup>241</sup> there are numerous frameworks in place that could influence the rights and policies related to lunar mining activities. Navigating through this maze of regulations could become a daunting task for any entity aspiring to participate in this emerging industry. Moreover, potential conflicts and overlaps may arise amidst these varying alliances. With a lack of certainty on which regulations are applicable, investors and innovators may be dissuaded from investing and contributing to an industry that is crucial for humanity's future Outer Space endeavors.

In these circumstances, the establishment of a cohesive and widely-accepted governing body could serve as a beacon of clarity amidst the labyrinth of varied guidelines. This authority could provide much-needed consistency to the lunar mining industry. With the presence of several alliances,<sup>242</sup> no single universally-acknowledged body dedicated to overseeing lunar mining activities currently exists. This void in authority could potentially impede the growth of the lunar mining industry. Consequently, this Part advocates for the need to establish a central and neutral authority that all entities would be willing to comply with. It explains how such a council could effectively address the lingering uncertainties in lunar mining governance across the three pivotal legal areas outlined in Part II: (i) ownership rights, (ii) non-interference policy, and (iii) environmental protection.

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241. See generally discussion *supra* Part II.

242. See, e.g., *supra* Section II.B.

*A. Granting Lunar Resource Ownership Rights*

The absence of territorial ownership rights in Outer Space poses a substantial hurdle to the growth of the lunar mining industry. Under widely-accepted international laws,<sup>243</sup> celestial bodies, such as the Moon, are considered the common province of humanity.<sup>244</sup> This implies that no entity, group, or country can claim sovereignty or absolute ownership over any specific area of the Moon. However, this absence of conventional ownership rights could lead to the inference that no one is entitled to mineral rights on the Moon, as such rights typically follow the legal ownership of a specific area.<sup>245</sup> This could present significant issues, given that the exclusive ownership of land acts as a catalyst in the modern economy; without such ownership rights, there is no incentive for the investment of resources needed to unlock the land's economic potentials.<sup>246</sup>

As Part II explored, new Outer Space governance regimes attempt to resolve this issue by either granting ownership rights over the extracted space resources or providing mining licensing rights over specific Outer Space areas.<sup>247</sup> However, these rights are generally limited to their citizens or entities under their jurisdiction.<sup>248</sup> As a result, an entity's right to ownership of certain space resources might only be recognized under one governance model. This scenario could create uncertainty with the potential that a competing country or alliance could challenge such claims in favor of its own citizens or entities. Therefore, without clear and universally-recognized ownership rights, an entity may not be incentivized to invest in the resources

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243. See *supra* Section II.A.1.

244. Outer Space Treaty, *supra* note 27, art. I; see also Li, *supra* note 66, at 809 (“Enshrined in this environment’s legal foundation is the concept that Outer Space is humanity’s common province.”).

245. See, e.g., *Bundle of Rights in Real Estate: Importance of Ownership Rights*, *supra* note 34 (indicating that “mineral rights” are a part of “less common rights” granted to a property owner).

246. See, e.g., Bankless, *120 – Marc Andreessen & Christ Dixon of a16z | Reinventing the Internet*, YOUTUBE, at 1:07:36 (May 30, 2022), <https://youtu.be/RXHITeaGB8Q?t=4057> [<https://perma.cc/BB35-BZFN>] (“The big economic turning point was clear title to land . . . because if you have clear title to land, then you have a motivation to improve the land . . . [O]nce you have ownership of land . . . [and] clear title to land, you can borrow against the value of the land . . . [I]t’s [this] borrowing against land value that made business possible . . . [T]his concept of ownership, this concept of title, this concept of assets [that gives the land owner the option], in a market economy, [to] realize the value . . . that inspires people to start to think creatively about the kinds of things that they might want to own or they can borrow against it and they can start unlocking other values investing into things.”).

247. See generally discussion *supra* Part II.

248. *Id.*

needed for lunar resource extraction. This in turn could block economic value from being unlocked for society as a whole.

Given the absence of traditional land ownership rights, the establishment of a universally-recognized governing body capable of efficiently licensing lunar mining activities becomes essential. This international organization could collate the different existing guidelines to form a universal framework for regulating lunar resource extractions. Operating within the bounds of existing international laws, this global organization can grant both exclusive and non-exclusive mining licenses to specific entities for particular lunar regions.

These licenses could effectively function as surrogate, but temporary, ownership rights over specific lunar parcels for resource extraction purposes only. As long as an entity conducts its mining operations according to its approved license, any lunar resources it extracts would be its to own. If this system garners broad-level acceptance from all spacefaring nations, then all lunar mining entities would be on the same standard. This would lead such ownership rights to become universally accepted. When this occurs, entities looking to venture into lunar mining operations would have the certainty they need, even in the absence of traditional land ownership rights.

Furthermore, this centralized impartial authority could also play a pivotal role in preventing disputes among different lunar mining entities. As long as this governing body establishes and enforces equitable and rational licensing guidelines, all entities would be clearly informed about the rules and procedures necessary to secure the resource mining rights needed for their operations. By ensuring that everyone operates within the same framework, the likelihood of a dispute over mining rights on a specific lunar parcel can be significantly reduced.

Moreover, should disagreements surface among various entities, this governing body could either establish or serve as a neutral venue for resolving these disputes. Garnering the endorsement of and participation from all interested parties, this committee would possess the legitimacy required to mediate and serve as the final arbiter in such conflicts. In its role as a de-confliction authority, this international organization can ensure the peaceful and harmonious development of the lunar mining industry.

As a central coordinator for all lunar mining operations, this authority would also be able to foresee and mitigate potential conflicts before they manifest. In this manner, it could significantly reduce instances of interference among different entities' lunar mining activities. Drilling deeper into this, the following section will examine the crucial role this neutral central authority can play in instituting enforceable non-interference mechanisms.

*B. Instituting Enforceable Non-Interference Mechanisms*

While varying lunar legal models have been promulgated,<sup>249</sup> they all share some common themes. One of these tenets is the principle of non-interference. In particular, these frameworks all strive to ensure that different lunar activities do not impede one another.<sup>250</sup> However, each of these governance models has its own distinctive way of maintaining the principle of non-interference. Some address this principle explicitly in the law itself, while others resolve it more implicitly through interpreting regulations;<sup>251</sup> while some are concerned with protecting their members from interference, others are focused on ensuring their constituents do not disrupt the operations of others.<sup>252</sup> But these divergent approaches could lead to confusion and uncertainty. Therefore, to enforce the non-interference principle across a broad spectrum of diverse lunar alliances and laws, the existence of a neutral, respected, and consensus-driving central authority is indispensable.

Given that members of one lunar organization might not necessarily belong to every other Moon-related association, implementing the non-interference principle could become challenging without a central governing body. For instance, in the absence of a neutral coordinating entity, two countries belonging to separate alliances might not be aware of each other's lunar activities. In these cases, unintentional interference may arise because of this lack of communication or awareness.

Moreover, competing entities may choose to ignore—or actively violate—the non-interference principle vis-à-vis each other's activities. Each side could justify such actions on the grounds that their activities do not amount to “interference” under their association's rules. Such disruptions could generate considerable friction among various parties, potentially leading to conflicts. The resulting interference could also hinder the long-term development and stability of a thriving lunar mining industry.

The establishment of a universally-recognized central authority could effectively mitigate these concerns. Assuming widespread consensual support, this governing council could establish and administer a comprehensive registry that records all active lunar mining operations.

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249. *Id.*

250. *Id.*

251. *Compare supra* Sections II.C.1, II.C.2, and II.C.4, with *supra* Section II.C.3 (U.S., Luxembourg, and Japan explicitly incorporate their international obligations under Outer Space treaties whereas UAE does so implicitly via interpreting regulations).

252. *Compare supra* Section II.C.1, with *supra* Sections II.C.3 and II.C.4 (U.S. explicitly protecting its citizens' mining activities whereas UAE's and Japan's focus is on how their regulated activities could affect the activities of others).

This database would provide detailed information on each operator's mining locations, equipment, timelines, and plans. Such a repository could be constructed from the information that mining operators are obligated to submit to acquire their lunar mining licenses.<sup>253</sup> These submissions would incentivize lunar mining entities to accurately depict their intended operations as they form the basis of their potentially exclusive mining rights. The council could stipulate that mining operators regularly update their operational data, ensuring that the database possesses real-time information on mining activities, along with any alterations to their initial plans.

Armed with such information, the central governing authority can effectively evaluate, oversee, and enforce all lunar mining operations, ensuring the successful implementation of the non-interference principle. Utilizing the database, the commission could conduct in-depth impact assessments to identify any potential areas of interference with other mining ventures, lunar activities, or sensitive lunar sites. In addition, by obligating entities to routinely update their information, the governing council can swiftly identify any deviations from approved plans and promptly take corrective measures to prevent potential conflicts. By using and maintaining this consolidated registry, the central mining agency can mitigate interference issues, ensuring the enforcement of responsible and sustainable lunar mining practices.

Furthermore, this centralized information platform can facilitate enhanced data-sharing and coordination among different entities, irrespective of their affiliations. While the governing council would have exclusive access to the sensitive data, other lunar mining operators could peruse certain elements of the repository. This open access would provide them with an overview of ongoing and upcoming mining operations on the lunar surface, thereby proactively preventing conflicts and overlapping claims. Additionally, mining entities could utilize this information to strategize on partnerships. This shared access to the repository could foster joint-collaboration and large-scale strategic projects within the lunar mining industry.

The administration of this comprehensive mining database could also promote transparency and accountability. All registered mining operations and their pertinent data would be readily available for scrutiny by the governing council and, when suitable, other mining operators. This open access could facilitate independent audits and public examination of lunar mining practices. Such transparency would serve to develop trust among all stakeholders and promote a sense of fairness in the allocation of lunar

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253. *See supra* Section III.A.

resources. This would help mitigate disputes, prevent the monopolization of resources, and promote the responsible and equitable development of the lunar mining industry.

The establishment of a central governing body for lunar mining activities could significantly boost the effective enforcement of the non-interference policy. This authority could generate and manage a comprehensive registry of approved mining activities, thereby considerably improve coordination among mining operators. The database would enable the proactive identification and management of potential interference risks, thereby ensuring that mining operations are conducted in a responsible and safe manner. The central governing body could utilize the information within this repository to supervise, regulate, and promote accountability among the various mining operations.

These processes could secondarily serve as a protective mechanism for other lunar activities as well as the lunar environment itself. Related to this point, the subsequent section will detail how the establishment of a neutral central authority can lead to the creation and enforcement of effective lunar environmental policies.

### *C. Promoting Effective Environmental Policies*

Similar to the principle of non-interference, all of the recently-established lunar-related legal frameworks advocate for some form of lunar environmental protection.<sup>254</sup> However, the lack of harmonized and universally-accepted regulations could lead to ambiguities and inconsistencies in environmental practices, thereby creating risks to the lunar ecosystem. Additionally, various lunar factions may hold differing opinions on what constitutes a site of cultural or historic significance, leading to potential disputes over which territories should be declared off-limits to lunar mining operations. As such, the establishment of a central authority is imperative to reconcile potential discrepancies in guidelines from various entities involved in the lunar mining industry.

A central governing council for lunar mining activities could play a pivotal role in coordinating different legal frameworks, consolidating them into a unified set of regulations that can provide clarity and consistency for all stakeholders. Absent such an agency, disparities in environmental standards could emerge, leading to inconsistent mining practices and potential harm to

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254. *See generally* discussion *supra* Part II.

the lunar environment. To facilitate broad-level compliance and confer legitimacy upon these universal regulations, this neutral arbitrator can leverage the expertise of scientists, environmentalists, industry professionals, and representatives of various entities. The ultimate goal would be the formulation of robust lunar policies that effectively balance the interests of mining operations with the need for environmental preservation. These comprehensive regulations would provide clear guidelines for mining operations, ensuring their adherence to responsible practices and minimizing their ecological footprint.

Alongside the preservation of the lunar environment, safeguarding lunar sites of historic and cultural significance is also crucial. However, as activities increase on the Moon, what is considered “heritage sites” could become contentious. Different factions may hold diverging views, leading to a situation where certain sites are deemed “sacred” by some entities, yet disregarded by others. This discrepancy could sow discord and potentially incite disagreements with far-reaching implications.

To prevent such conflicts, a central governing council could function as an impartial adjudicator in declaring certain locations as heritage sites. By convening a panel of experts from diverse fields and groups, this authority can objectively assess and designate sites of historic or cultural significance. Such a procedure would instill much-needed credibility to the process, thereby garnering acceptance from all entities involved. This neutral and objective approach would promote transparency and fairness, leading to successful preservation of lunar sites of cultural and historic importance.

Furthermore, a centralized authority would play a crucial role in promoting sustainable mining practices on the Moon. One of the key advantages of a neutral governing committee is its ability to enhance collaboration and knowledge-sharing among various stakeholders. By bringing together mining entities, governments, international organizations, and scientific communities, this authority could foster a cooperative environment where ideas, expertise, and best practices are freely exchanged. Regular conferences, workshops, and research collaborations would facilitate the exchange of knowledge, spurring innovation in the realm of sustainable mining technologies. Through these collective endeavors, the governing body would not only ensure consistent environmental measures but also catalyze advancements designed to minimize the ecological impact of lunar mining activities.

By harmonizing divergent guidelines, serving as a neutral arbitrator in the designation of lunar heritage sites, and fostering global collaboration, a central neutral governing council can ensure that lunar mining activities are conducted in an environmentally-responsible fashion. Moreover, this body

would contribute to the sustainable development of the lunar environment, safeguarding the Moon's unique ecosystem, historic sites, and resources for future generations. Such environmental protection mechanisms, coupled with the agency's ability to resolve uncertainties related to lunar resource ownership rights as well as to implement enforceable non-interference polices, would establish a stable and conducive environment for the growth of a thriving lunar mining industry.

Nevertheless, critics may assert that the notion of a neutral central authority to manage lunar mining operations represents a radical departure from the prevailing legal framework governing Outer Space activities. The next Part addresses this concern. The subsequent discussion will demonstrate the existence of similar mechanisms, processes, or organizations that are regulating other analogous activities related to Outer Space. Drawing parallels to these established protocols, Part IV will reinforce the feasibility and practicality of such a central authority in managing lunar mining operations.

#### IV. ALIGNMENT WITH EXISTING LEGAL STRUCTURES

The establishment of a neutral central authority should address the multitude of challenges that could hinder the growth of a thriving lunar mining industry. But critics may voice concerns that such an authority might not fit within the prevailing legal architecture for Outer Space. On the contrary, the establishment of this agency could find support within existing Outer Space-related frameworks. This Part will explain how the abilities of such an authority in (i) accommodating ownership rights, (ii) enforcing non-interference policies, and (iii) championing environmental protection have basis in precedents currently regulating other Outer Space-related undertakings.

##### *A. Licensing Mining Operations*

Instituting a central authority that can manage lunar resources is not a novel concept and could align seamlessly with the non-appropriation principle. This approach draws a compelling parallel with the International Telecommunication Union ("ITU") and its role in allocating orbital slots in

the Geostationary Orbit (“GEO”).<sup>255</sup> Through this lens, the establishment of a lunar mining council can be seen not as a radical departure but rather a logical extension of the existing Outer Space governance structure.

Founded in 1865, the ITU is now a United Nations agency that manages global connectivity.<sup>256</sup> As a result of the first space age’s expansion of the global communication systems, the ITU’s mandate was broadened to encompass rules and regulations related to satellite communications, particularly those satellites situated in the GEO.<sup>257</sup> Given unique orbital mechanics, objects located in the GEO will always appear stationary to a fixed point on Earth.<sup>258</sup> Thus, Earth-based satellite receivers do not need to track these GEO satellites;<sup>259</sup> this creates stable global communication networks with low operational costs.<sup>260</sup> But the GEO is “a limited natural resource,” and its availability is further constrained by the need for adequate spacing to prevent interference.<sup>261</sup> Consequently, orbital slots in the GEO must be properly managed. In response to this need, the international community entrusted the ITU with the responsibility of managing the GEO; therefore, the agency is empowered to assign and allocate orbital slots so that there is “a balance between equitable access and efficient use of telecommunications services.”<sup>262</sup>

Yet, this delegated power essentially confers a central neutral authority, the ITU, with the ability to grant certain “property rights” in a region that is intrinsically non-appropriable.<sup>263</sup> However, the global acceptance of this

255. See generally Alex S. Li, *The International Telecommunications Union: Orbital Parking Enforcement*, #THESPACEBAR (July 16, 2017), <https://alexli.com/thespacebar/2017/7/the-international-telecommunications-union-orbital-satellite-parking-enforcement> [<https://perma.cc/6G86-DEUK>] (“The ITU is an agency of the United Nations that is responsible for assigning and allocating ‘parking spots’ or orbital slots on the GEO for satellites.”).

256. *About International Telecommunication Union (ITU)*, INTERNATIONAL TELECOMM. UNION, <https://www.itu.int/en/about/Pages/default.aspx> [<https://perma.cc/YP2M-LJXM>].

257. *Overview of ITU’s History*, INT’L TELECOMM. UNION, <https://www.itu.int/en/history/Pages/ITUsHistory-page-5.aspx> [<https://perma.cc/4R5S-XT66>].

258. Li, *supra* note 255.

259. *Id.*

260. See *id.* (“While some maintenance and orbital station-keeping is necessary to keep an object, such as a satellite, in GEO from the effects of solar wind, radiation pressure, longitude drift, and etc., the lifetime of a satellite in GEO tends to be long.”).

261. See *id.* (“But, with only a limited amount of space in the GEO ring and spacing requirements needed to prevent interference of satellites on one another’s working frequencies, there are only a certain number of ‘parking spots’ available for satellites.”).

262. *Id.*

263. Henry R. Hertzfeld & Frans von der Dunk, *Bringing Space Law into the Commercial World: Property Rights Without Sovereignty*, 6 CHI. J. INT’L. L. 81, 83 (2005) (“Although this

agency indicates that the international community does not view the non-appropriation principle as a bar to the regulation and management of certain Outer Space resources. Thus, a licensing regime for lunar resources could harmonize with the non-appropriation principle if the regulatory entity promotes a framework that encourages responsible and sustainable resource management. This approach would recognize the “common heritage” principle for Outer Space while simultaneously addressing the practical realities of resource extraction and the need for coordinated oversight.

Therefore, the framework by which the ITU manages the GEO serves as a compelling precedent; it demonstrates that the establishment of a central agency, with licensing rights over certain resources, is compatible with the current governance structure for Outer Space. Guided by the precedent set by the ITU in licensing GEO orbital slots, this approach would not represent a novel departure but rather a logical extension of widely-accepted principles to the Moon’s limited resources. By adopting a streamlined licensing regime, this central authority can also ensure equitable access to, minimize conflicts in, and promote efficient utilization of different resource-rich regions of the Moon.

But to further regulate mining activities on the Moon, this central governing body must also be empowered to enforce the non-interference principle. As the previous Part discussed, the creation of a comprehensive database that records all lunar mining activities could be a pragmatic and transparent method for implementing such policies.<sup>264</sup> The subsequent section will build on this premise and demonstrate how this approach also aligns with and extends from an existing precedent.

### *B. Ensuring Non-Interference*

As discussed earlier, a central repository that can keep track of all active lunar mining activities can significantly facilitate the enforcement of non-interference policies on the Moon. With a precedential system already in place for Outer Space, the existing governance model would likely allow the creation and administration of such a database. Here, the analogous repository is the registry implemented under the Convention on Registration

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[ITU-granted] right to use the traditional spectrum is not exactly a traditional property right, it does grant use of a limited resource in space for business purposes for the lifetime of the particular satellite proposed to be used.”).

264. See discussion *supra* Section III.B.

of Objects Launched into Outer Space,<sup>265</sup> commonly known as the Registration Convention.

Adopted by the United Nations in 1976,<sup>266</sup> the Registration Convention instituted a systematic process for countries to submit information about the objects they launch into Outer Space.<sup>267</sup> The information—ranging from launch location and the space object’s orbital parameters to its general function—is then compiled into an open and accessible registry.<sup>268</sup> The international community can use this database to coordinate and manage activities in Outer Space.<sup>269</sup> Furthermore, since the registry is publicly accessible, an entity planning to operate in Outer Space can proactively ensure that its activities neither interfere with nor are interrupted by others’ activities. Hence, this registry plays an instrumental role in fostering transparency, cooperation, and responsible conduct in an environment that lacks stringent regulation.

To establish legitimacy, the lunar governance council can build its database based on the registry established by the Registration Convention. Lunar mining entities would submit information similar to those requested by the existing convention: the identity of the operators, the location of these activities, and the broad project plans.<sup>270</sup> This database could then be employed as a tool to clearly define each entity’s operational boundaries, allowing for the effective enforcement of the non-interference policy.

Furthermore, this database could facilitate cooperation and collaboration among different entities, akin to the role the Registration Convention has played for space-faring nations. By serving as a centralized information hub for all lunar mining activities, this registry could help to identify potential collaborations, encourage the sharing of best practices, and provide information needed to resolve disputes. Utilizing the database in this manner

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265. G.A. Res. 3235 (XXIX), Convention on Registration of Objects Launched into Outer Space (Jan. 14, 1975) [hereinafter Registration Convention].

266. Li, *supra* note 25, at 721.

267. See Li, *supra* note 14, at 675 (“[T]he Registration Convention dictated a specific set of information that a country must submit for its Outer Space objects.”).

268. See generally *United Nations Register of Objects Launched into Outer Space*, U.N. OFF. FOR OUTER SPACE AFFS., <https://www.unoosa.org/oosa/en/spaceobjectregister/index.html> [https://perma.cc/7RKU-YHTT] (“Since 1962, the United Nations has maintained a Register of Objects Launched into Outer Space.”).

269. See Li, *supra* note 25, at 721 (“While a relatively straightforward treaty, this convention plays a critical role in giving teeth to and ensuring the success of other space-related treaties.”).

270. See Registration Convention, *supra* note 265, art. IV. Such information would be similar to those asked for by the Registration Convention which would establish a space object’s location, function, and responsible party.

would be in alignment with the cooperative ethos embodied by the existing Outer Space governance structure.<sup>271</sup>

Thus, the establishment of a database to help manage lunar mining activities is not so much a pioneering endeavor as it is a logical progression of the existing Outer Space governance framework. Utilizing this registry to ensure appropriate separation among various entities' mining operations aligns with the spirit of today's international laws governing Outer Space activities. By instituting such a repository, the governance council essentially adapts the Registration Convention to suit the unique needs of the lunar mining industry. Therefore, this registry is not a radical departure from existing Outer Space legal norms, but rather a sound extension of existing precedent to a future necessity.

The implementation of such a lunar mining database would also enable the assessment of each mining operation's environmental impact. As discussed earlier, a neutral central authority would also be well-suited to address lunar environmental concerns.<sup>272</sup> The forthcoming section will further illustrate how this particular role of the lunar mining council aligns with an existing, albeit indirect, Outer Space precedent.

### C. *Protecting the Lunar Environment*

The establishment of a central lunar mining organization to address environmental concerns can find a pertinent precedent in the Comprehensive Nuclear-Test-Ban Treaty Organization ("CTBTO"). Albeit indirectly related to Outer Space, the CTBTO has a mission to monitor and prevent nuclear testing "by everyone, *everywhere*: above ground, under water and underground."<sup>273</sup> By mitigating the hazards of nuclear weapon testing everywhere, the CTBTO indirectly contributes to the protection of the Outer Space environment. Although not fully operational because its underlying treaty—the Comprehensive Nuclear-Test-Ban Treaty ("CTBT")<sup>274</sup>—has not

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271. See *id.* p.mbl. ("Believing that a mandatory system of registering objects launched into outer space would, in particular, assist in their identification and would contribute to the application and development of international law governing the exploration and use of outer space.").

272. See *supra* Section III.C.

273. *Ending Nuclear Tests*, CTBTO PREPARATORY COMM'N (emphasis added), <https://www.ctbto.org/our-mission/ending-nuclear-tests> [<https://perma.cc/YD2Z-YAE8>].

274. See *The Preparatory Commission*, CTBTO PREPARATORY COMM'N, <https://www.ctbto.org/our-mission/the-organization/the-preparatory-commission> [<https://perma.cc/284V-SRDL>] ("According to the Annex of the resolution establishing the

reached the required number of ratifications, the CTBTO is an example of a central authority capable of effectively addressing environmental challenges in Outer Space.

For instance, the lunar mining governing council's ability to consolidate diverse regulations mirrors the CTBTO's efforts in instituting a unified verification regime for the detection of nuclear tests. Once operational, the CTBTO will operate an International Monitoring System that can alert the international community of any potential nuclear tests.<sup>275</sup> Additionally, the CTBTO is charged with carrying out on-site inspections to corroborate potential violations of the CTBT.<sup>276</sup> To effectively implement these verification regimes, the CTBTO has to develop specific guidelines, procedures, and regulations. The CTBT grants this authority to the CTBTO's "Technical Secretariat," tasking it with the assignment to create and maintain "operational manuals [that can] guide the operation . . . of the verification regime."<sup>277</sup> This would result in a singular and standardized protocol for identifying nuclear test ban breaches. Such a uniform set of guidelines should also encourage nations to adopt measures that are globally consistent.

Similarly, a lunar mining authority could consolidate guidelines, protocols, and regulations to ensure a systematic and consistent approach to environmental protection. By facilitating a centralized framework for monitoring and enforcing environmental safeguards, the council can guarantee uniformity in the measures undertaken by all nations involved in lunar resource extraction. Just as the CTBTO's verification regime promotes the CTBT's environmental protection goals, the lunar governing council's streamlined standards would be in alignment with the principle of environmental protection in existing Outer Space treaties.<sup>278</sup> Consequently, this central authority can significantly contribute to the preservation of the lunar environment and the responsible use of its resources.

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Commission, its main purpose is to carry out the necessary preparations for the effective implementation of the CTBT and to prepare for the first session of the Conference of States Parties to the Treaty, which will take place when the CTBT has entered into force.”).

275. *Overview of the Verification Regime*, CTBTO PREPARATORY COMM’N, <https://www.ctbto.org/our-work/verification-regime> [<https://perma.cc/W6KN-LRU4>].

276. *Id.*

277. Comprehensive Nuclear-Test-Ban Treaty (CTBT) art. II.D.44, Sept. 24, 1996, S. TREATY DOC., NO. 105-28 (1997), 35 I.L.M. 1439 [hereinafter CTBT], [https://www.ctbto.org/sites/default/files/Documents/CTBT\\_English\\_withCover.pdf](https://www.ctbto.org/sites/default/files/Documents/CTBT_English_withCover.pdf) [<https://perma.cc/46YS-9YXC>].

278. For an explanation of the Outer Space Treaty's environmental considerations, see *supra* Section II.A.1.

Furthermore, the cooperative nature of the CTBTO encourages international collaboration and dialogue among its member states. For instance, the CTBTO will also supply its members with data and assessments via the International Data Centre.<sup>279</sup> Through this mechanism, all members can pool their resources together to analyze the specifics of a potential nuclear test. This effectively creates a collaborative framework to contain the harmful effects of nuclear tests, thereby contributing to the preservation of the global environment.

In the realm of lunar mining, a central authority can adopt a similar approach, facilitating cooperation among all stakeholders. This cooperative model enables the sharing of knowledge and experiences, leading to the development of effective environmental guidelines and practices. Such collaborations ensure that the utilization of lunar resources not only aligns with international standards but also contributes to the conservation of the lunar environment.

Hence, the establishment of a central lunar mining authority that can enforce environmental measures can draw upon the CTBTO as a precedent. Although the CTBTO's primary purview is terrestrial activities, its mandate extends to monitoring nuclear testing in Outer Space.<sup>280</sup> While the CTBTO is not fully operational, it stands as an example of a neutral commission established with a specific goal of environmental protection. Consequently, the CTBTO's existence substantiates the argument that creating a central lunar mining governance council, with the responsibility of environmental protection, aligns with current legal frameworks related to Outer Space.

As evidenced in this Part, the establishment of a central authority to regulate various aspects of lunar mining activities is well-aligned with the prevailing Outer Space governance architecture. As a result, the next question naturally turns to how such a lunar mining council should be organized and managed. The next Part addresses this topic by offering insights into the structure and administration of such a neutral central authority.

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279. *International Data Centre, CTBTO PREPARATORY COMM'N*, <https://www.ctbto.org/our-work/international-data-centre> [<https://perma.cc/Y7QP-5VEG>].

280. See CTBT, *supra* note 277, pmb1. (“*Noting* the aspirations expressed by the Parties to the 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in *Outer Space* and Under Water to seek to achieve the discontinuance of all test explosions of nuclear weapons for all time.” (second emphasis added)).

## V. A BLUEPRINT FOR THE LUNAR MINING AUTHORITY

Having established the practical advantages that a central lunar mining authority can offer, the conversation naturally shifts to how this organization should be structured. With this transition from “why” to “how,” a critical question emerges: is there a credible international institution capable of organizing and operationalizing such a commission? An obvious answer surfaces: the United Nations (“UN”), an organization that is imbued with a broad level of international support and authority.<sup>281</sup>

As a globally-recognized entity with a proven track record in mediating shared resource issues, fostering international cooperation, and championing sustainable development,<sup>282</sup> the UN is the ideal organization under which a central lunar mining authority should be established. Housing this governing body under the UN banner would inherently offer assurances of neutrality and impartiality.<sup>283</sup> Moreover, it would ensure that the operations of the lunar mining council align with UN’s international standards and guiding principles.

Operating under the aegis of the UN, the lunar mining agency can more easily obtain popular acceptance. With this legitimacy, the lunar mining authority could rise above narrow national interests and serve as a collaborative conduit for global lunar ambitions; it can function as a mediating platform capable of sensitively addressing any geopolitical intricacies that surround lunar mining operations.

This Part will delve deeper into this concept by proposing a blueprint for this lunar mining council. This discussion will focus on considerations for the agency’s (i) structure, (ii) membership, (iii) leadership, and (iv) governance. By thoughtfully implementing these core elements, the lunar mining authority can become an efficient and effective symbol of international cooperation in a renewed era of lunar exploration.

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281. See, e.g., Moira Fagan & Christine Huang, *United Nations Gets Mostly Positive Marks from People Around the World*, PEW RSCH. CTR. (Sept. 23, 2019), <https://www.pewresearch.org/short-reads/2019/09/23/united-nations-gets-mostly-positive-marks-from-people-around-the-world/> [<https://perma.cc/4PHS-MWPB>] (“The UN has a positive international image.”).

282. See *About Us*, UNITED NATIONS, <https://www.un.org/en/about-us> [<https://perma.cc/XC8G-PLMH>] (“[The UN] remains the one place on Earth where all the world’s nations can gather together, discuss common problems, and find shared solutions that benefit all of humanity.”).

283. See *Putting Ethics To Work: A Guide for UN Staff*, U.N. ETHICS OFF. (Oct. 2017), [https://www.un.org/en/ethics/assets/pdfs/Attachment\\_2\\_EN\\_Putting%20Ethics%20to%20Work.pdf](https://www.un.org/en/ethics/assets/pdfs/Attachment_2_EN_Putting%20Ethics%20to%20Work.pdf) [<https://perma.cc/99A5-WPNF>] (“The UN Oath of Office requires [the UN] to act with impartiality and independence.”).

*A. Structure*

Charting unexplored territory in the realm of Outer Space governance, the lunar mining council requires an organizational structure that combines stability with adaptability. As it navigates the multitude of interests intertwined with lunar mining activities, this council must possess an effective capacity for leadership and operational competency. To this end, the lunar mining authority could consist of a decision-making body at its helm, accompanied by an operational arm.

A decision-making body would stand at the top of the lunar mining authority. This executive committee, tasked with setting the strategic course for lunar mining activities, would essentially set the tone and direction for the agency. Its founding charter should be aiming to (i) establish a uniformed licensing structure for lunar mining activities, (ii) mitigate potential conflicts over lunar resources, and (iii) promote responsible and sustainable lunar mining activities. This governing body would manage all executive decisions and tasks associated with lunar mining operations, including setting overarching policies, formulating licensing protocols, establishing conflict resolution procedures, and drafting sustainability guidelines.

In parallel, the lunar mining authority would need a proficient and experienced operational branch to translate the directives of the decision-making body into actionable processes. Rather than creating a new office for these administrative tasks, this role could be efficiently assumed by the United Nations Office for Outer Space Affairs (“UNOOSA”). Given its expertise in managing the complexities of Outer Space governance and its current roles and responsibilities for the Committee on the Peaceful Uses of Outer Space (“COPUOS”),<sup>284</sup> the UNOOSA could seamlessly become the operational companion to this new lunar mining authority.

The UNOOSA would serve as the new authority’s administrative backbone. It would translate the executive body’s decisions into implementable actions, manage the day-to-day affairs related to lunar mining, and oversee the execution of the lunar mining authority’s directives. By leveraging existing UN structures and resources, this model would ensure that the new authority will benefit from existing knowledge and experience.

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284. See U.N. OFF. FOR OUTER SPACE AFFS., ANNUAL REPORT 2022, at 2, [https://www.unoosa.org/documents/pdf/annualreport/UNOOSA\\_Annual\\_Report\\_2022.pdf](https://www.unoosa.org/documents/pdf/annualreport/UNOOSA_Annual_Report_2022.pdf) [<https://perma.cc/7VNS-JFZ3>] (“[UNOOSA] is integral to the work of the United Nations in advancing multilateralism on space matters as it serves as the secretariat to the Committee on the Peaceful Uses of Outer Space (COPUOS) . . .”).

Thus, the UNOOSA would enable the new central body to hit the ground running.

To ensure that the executive committee functions effectively and properly with the UNOOSA, well-defined communication pathways should be established. This would ensure that the two components are operating with transparency, accountability, and efficacy. Moreover, the lunar mining authority should be receptive to periodic reviews and audits by the UN to ensure its operational integrity and its adaptability to evolving lunar mining circumstances.

In summary, the proposed organizational structure for the lunar mining governance body would consist of a decisive executive entity supported by an efficient administrative organ. This model is designed to address the complexities and dynamic nature of lunar mining governance, ensuring that lunar resources are utilized effectively, responsibly, and sustainably for the benefit of humankind.

But in order to guarantee that the council is genuinely responsive to the needs of the global community, it must have a diverse international membership. The next section will propose a membership structure that considers this imperative for diversity.

### *B. Membership*

The composition of this new central lunar mining authority is of paramount importance. Only with fair and widespread representation can the council's decisions garner global acceptance. Hence, the executive committee should encompass a wide-array of international interests, capabilities, and aspirations related to lunar mining activities. Balancing the principle of equality with the necessity of expertise, the authority's governing body should be comprised of two distinct groups: permanent and rotating members. Echoing the UN Security Council's structure,<sup>285</sup> this dual membership framework acknowledges varying levels of lunar involvement and technological capabilities while ensuring equitable representation.

The cohort of permanent members would form the backbone of the executive committee. These seats would be held by nations that have demonstrated significant advancement and investment in lunar mining activities. As trailblazers in lunar exploration, these countries—and the

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285. U.N. Charter ch. V, art. 23, <https://www.un.org/en/about-us/un-charter/chapter-5> [<https://perma.cc/7TFG-8HXP>] (indicating that the Security Council is made of permanent members and rotating members).

entities they are responsible for—would have invested considerable technological, financial, and human resources into the development of the lunar mining industry. Through this process, they also would have accumulated substantial expertise and insights. Their inclusion as permanent members acknowledges their contributions and ensures that their acquired expertise would be considered during the governing council’s decision-making process.

However, the principle of Outer Space as the common province of humanity<sup>286</sup> implies that the lunar mining industry should not be limited to a handful of dominant players. This nascent industry’s future development will benefit from a diverse array of perspectives and ideas. Therefore, the executive committee should also include rotating members, representing nations with emerging yet ambitious lunar exploration programs. The rotational mechanism ensures the influx of fresh perspectives, enhancing the council’s collective knowledge and wisdom.

The responsibility for selecting these permanent and rotating members should be vested in COPUOS. COPUOS’s in-depth knowledge of Outer Space matters can be used to assess prospective candidates’ commitment to and potential contribution to the development of the lunar mining industry. One potential prerequisite could be that membership on the executive committee would be limited to current COPUOS’s members. This would be an equitable filtering mechanism as membership in and involvement with COPUOS signifies a country’s interest, engagement, and experience in Outer Space governance.<sup>287</sup>

Furthermore, COPUOS should devise a set of criteria for membership on the executive committee. These criteria should reflect a range of considerations, including a nation’s current and future scientific and

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286. Outer Space Treaty, *supra* note 27, art. I; *see also* Li, *supra* note 66, at 809 (“Enshrined in this environment’s legal foundation is the concept that Outer Space is humanity’s common province . . .”).

287. *See Committee on the Peaceful Uses of Outer Space*, U.N. OFF. FOR OUTER SPACE AFFS., <https://www.unoosa.org/oosa/en/ourwork/copuos/index.html> [<https://perma.cc/X6AF-ZVGP>].

The Committee was instrumental in the creation of the five treaties and five principles of outer space. International cooperation in space exploration and the use of space technology applications to meet global development goals are discussed in the Committee every year. Owing to rapid advances in space technology, the space agenda is constantly evolving. The Committee therefore provides a unique platform at the global level to monitor and discuss these developments.

*Id.*

technological capabilities, its commitment to sustainable lunar mining activities, and its contribution to the collective understanding of the Moon. The resulting “profile” would serve as an objective benchmark to assess each candidate-State’s qualifications for service on the committee. This would enhance the lunar mining council’s commitment to objectivity, transparency, and fairness in its composition.

This proposed composition for the lunar mining executive committee would mirror the global lunar development landscape, harmonizing the influence of lunar exploration veterans with that of emerging actors. The resulting committee—rich with a blend of established knowledge and fresh ideas—will be able to have comprehensive and diverse discussions, thereby reflecting the council’s foundational principles of expertise and equity.

Nevertheless, even with a diverse membership, the council will still require a unifying voice to steer its agenda. Thus, the subsequent section will focus on the leadership aspect of the lunar mining authority.

### *C. Leadership*

Effective leadership is a cornerstone of any successful international organization, and the lunar mining authority is no exception. For this institution to flourish, it must have a leadership role that balances the ability to effectively implement strategic initiatives with the capability for seamless leadership transitions. Borrowing a proven model, the executive committee could adopt a rotational presidency similar to that of the United Nations Security Council.<sup>288</sup>

Under this structure, each member-state, be it permanent or rotating, would have an opportunity to assume the governing body’s presidency. This rotational leadership style ensures equitable representation and reinforces the notion that all nations—whether an established or emerging lunar participant—on the council have an integral role in lunar mining governance. Selecting the presiding officer in this manner encourages shared responsibility, a crucial factor in fostering international cooperation and unity in the exploration and utilization of lunar resources.

Similar to the Security Council,<sup>289</sup> the presidential term should follow a regular cadence, perhaps monthly, to guarantee frequent rotation. Such a structure can avert stagnation that may result under a more rigid leadership

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288. See *Security Council Presidency*, U.N. SEC. COUNCIL, <https://www.un.org/securitycouncil/content/presidency> [https://perma.cc/2TVS-UVCE].

289. *Id.*

model. It would also empower nations, particularly those with emerging Outer Space programs, to cultivate their leadership skills, diplomatic acumen, and strategic thinking in the complex arena of Outer Space governance; each member can use its turn at leadership to shape the council with its unique perspective and innovative approach. But with the term duration kept not too long, such member is still incentivized to foster a collaborative and vibrant working environment conducive to policy implementation.

The responsibilities of the presiding member would extend beyond mere ceremonial duties. The council's president would shape the executive committee's meeting agenda, thereby facilitating discussions on critical issues surrounding the lunar mining industry. This officer would also lead the implementation of the council's directives and serve as the de-facto representative of the council with the broader UN community as well as the public at large.

In support of this leadership position, the UNOOSA, serving as the operational arm of the lunar mining authority,<sup>290</sup> can function as the supporting secretariat as well. In this role, the UNOOSA can provide continuity and ensure the smooth function of the executive committee by maintaining institutional memory. The presiding member can lean on the UNOOSA for assistance in fulfilling its duties and managing the council's activities.

The proposed leadership model for the lunar mining authority is designed to promote equality, inclusivity, and shared responsibility. The rotating presidency offers the benefits of a dynamic framework, injecting fresh ideas into lunar mining governance discussions and promoting cooperation among member-states. Assisted by the UNOOSA, the presiding member can ensure that its vision for lunar mining governance aligns with the council's jurisdictional limitations. As each member is provided an opportunity to take the leadership mantle, the governing body can instill a sense of collective responsibility and ownership. This would further encourage a united approach toward the development of a sustainable lunar mining industry.

However, to have effective leadership, a standard decision-making process must be implemented. This will facilitate the official adoption of the council's policies and positions. The next section offers a few recommendations on how the executive committee should manage such operations.

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290. See discussion *supra* Section V.A.

*D. Governance*

In alignment with the Outer Space Treaty, this lunar mining authority's governance process must embody fairness, inclusivity, and efficiency. To effectuate these principles, the executive committee should develop a thorough process for proposing, deliberating, and voting on decisions. This includes (i) creating mechanisms for members to propose initiatives, (ii) providing ample opportunities for discussions as well as negotiations, and (iii) setting clear voting procedures.

Furthermore, this institution's formal policies should be shaped in a manner that balances the interests of countries with little to no lunar involvement and the needs of the lunar mining industry. To achieve this objective, the executive committee should institute a two-tiered voting system: a super-majority approval process for major directives and a simple majority approval process for operational decisions.

For passing major directives, the executive committee should require a super-majority vote. This would include crucial matters such as licensing processes, dispute resolution procedures, and environmental policies. A super-majority voting system for these pivotal issues protects the interest of the minority by ensuring thoughtful deliberations occur for decisions of significant impact. In light of the varying levels of lunar technological and operational capabilities among different countries, this is imperative to prevent a scenario where the current dominating operators monopolize the lunar environment at the expense of future emerging participants. By requiring a two-thirds majority vote for these major directives, the governance system can ensure that only thoughtfully-considered proposals that balance innovation with fairness are advanced.

However, by not requiring full consensus on key decisions, the system prevents any single member from unilaterally blocking decisions; this would mitigate the risk of decision paralysis through potential veto-like powers—a challenge facing the current UN Security Council structure.<sup>291</sup> Meanwhile, a super-majority threshold balances the interests of both the majority and the minority, fostering a culture of negotiation, dialogue, and consensus-building among member-nations. Given the complex and sometimes contentious

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291. See *The UN Security Council*, COUNCIL ON FOREIGN RELS. (Feb. 28, 2023), <https://www.cfr.org/background/un-security-council> [<https://perma.cc/6GWU-WHL8>] (“Still, in early 2022, UN General Assembly President Csaba Korosi and U.S. President Joe Biden both said that reforming the Security Council should be an important objective. In his 2022 address to the United Nations, Biden urged P5 countries to refrain from overusing the veto.”).

issues the council will face, maintaining such a harmonious and cooperative atmosphere is vital.

Yet, the committee's decision-making process also needs to be adaptable to issues of different significance and urgency. While a super-majority system is fitting for strategic directives, a simple majority vote might suffice for routine operational decisions. These could include votes confirming UNOOSA's activities or approving meeting minutes. This two-tiered voting system ensures the council's governance system is both fair and flexible.

To enhance transparency and accountability, clear criteria distinguishing between major and routine decisions should be established. Initially defined in the council's charter, these criteria could consider factors such as the issue's impact on lunar mining activities or whether a significant number of entities would be affected by the decision. As the agency gains experience, these criteria can be altered to match changing times and circumstances.

These recommendations pertaining to the structure, membership, leadership, and governance model can establish a strong and resilient foundation for the lunar mining authority. Adhering to these elements empowers this governing body to operate efficiently, inclusively, and innovatively. By conducting its business in such a collaborative, effective, and transparent manner, this organization could achieve widespread adoption. At that point, this lunar mining authority can become a credible voice in untangling the intricate web of overlapping laws currently dotting the lunar mining legal landscape.

## VI. THE RISE OF A FULL MOON

The labyrinth of legal regimes that currently surround the lunar mining industry can be a significant barrier to entry. Thus, there is a pressing need for a singular governing organization that can unify this field. Such an institution could untie the knot of legal uncertainties and act as a beacon of clarity to guide this industry's development.

In this Article, I propose a solution to harmonize the multitude of legal voices surrounding the lunar mining industry. I begin by examining how various legal regimes approach the three key issues surrounding this field: resource ownership rights, non-interference principle, and environmental policies. Given the potential confusion that can arise from this cacophony of legal voices, I argue for the establishment of a central neutral lunar mining authority to consolidate these frameworks.

Critics may question whether the creation of such an institution aligns with the existing legal frameworks. I respond to these concerns by drawing parallels to established precedents regulating other Outer Space-related

activities. Through these examples, I demonstrate that the establishment of such a centralized lunar mining authority does align with existing Outer Space legal doctrines.

To garner widespread adoption and acceptance, I recommend launching this lunar mining governance council as a United Nations agency. I also offer a structural blueprint, covering various fundamental elements necessary for the implementation of such a central authority. These recommendations will ensure that this institution can operate efficiently, inclusively, and innovatively.

But the development and establishment of this organization should only be considered an initial step. The lunar mining landscape will continue to evolve, shaped by technological advancements and our deepening understanding of the lunar environment. Therefore, the challenges we face today may be replaced by new ones tomorrow. Thus, continued international cooperation and dialogue are of paramount importance. The willingness to adapt, revise, and develop new legal processes and procedures in sync with our evolving lunar needs will be critical.

A centralized lunar mining authority could serve as a collaborative forum for this continuous journey of legal refinement. It can ensure that changes are implemented with careful consideration for both the lunar environment and all nations on Earth, regardless of their spacefaring capabilities.

While this proposed governance structure is specific to the lunar mining industry, this organization's successful implementation could illuminate the path for creating governance structures for other Outer Space-related activities as well. By following the guidelines established by these consensus-building agencies, we can boldly forge a new path forward—one marked by a collective resolve and a shared vision—for our species to further expand our reaches in the stars.