

*If Space is 'the Province of Mankind',  
Who Owns its Resources?*

**An Examination of the  
Potential of Space Mining and  
its Legal Implications**

SENJUTI MALLICK  
RAJESWARI PILLAI RAJAGOPALAN

*If Space is 'the Province of Mankind',  
Who Owns its Resources?*

**An Examination of the Potential  
of Space Mining and its Legal  
Implications**

SENJUTI MALLICK  
RAJESWARI PILLAI RAJAGOPALAN

## ABOUT THE AUTHORS

**Senjuti Mallick** graduated from ILS Law College, Pune, in 2016. She was a Law Researcher at the High Court of Delhi from 2016 to 2018 and is currently pursuing LL.M in International Law at The Fletcher School of Law and Diplomacy, USA. She has been doing research on Outer Space Law since she was a student at ILS. Presently, she is working on different aspects of Space Law, in particular, Space debris mitigation and removal, and the law of the commons. She has published articles on Space Law in the *All India Reporter Law Journal* and *The Hindu*.

**Rajeswari Pillai Rajagopalan** is Distinguished Fellow and Head of the Nuclear and Space Policy Initiative at Observer Research Foundation. She is also the Technical Adviser to the UN Group of Governmental Experts (GGE) on Prevention of Arms Race in Outer Space (PAROS). As a senior Asia defence writer for *The Diplomat*, she writes a weekly column on Asian security and strategic issues. Dr. Rajagopalan joined ORF after a five-year stint at the National Security Council Secretariat (2003-2007), where she was Assistant Director. Prior to joining the NSCS, she was Research Officer at the Institute of Defence Studies and Analyses, New Delhi. She was also a Visiting Professor at the Graduate Institute of International Politics, National Chung Hsing University, Taichung, Taiwan in 2012. She is the author of four books, including *Nuclear Security in India* (2015); and *Clashing Titans: Military Strategy and Insecurity among Asian Great Powers* (2012).

ISBN : 978-93-88262-81-1

*If Space is 'the Province of Mankind',  
Who Owns its Resources?*

## **The Potential of Space Mining and its Legal Implications**

### **ABSTRACT**

Half a century after the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space, the current debates are focused on new sets of challenges such as space mining, which used to belong only to the realm of science fiction. This paper analyses the rationale for extraterrestrial mining, as well as the efforts and responses of various countries—i.e, USA, Luxembourg, Russia, China and India. In examining the legal and governance basis for States and commercial players, this paper appreciates the economic benefits of space mining but argues against the national legislations legalising extraterrestrial appropriation of resources due to inconsistency with international treaties and customary international law. It further argues that the concept of “common heritage of mankind” is defeated in the light of such legal frameworks. The paper ponders the global governance challenges brought about by space mining activities and suggests legal, policy and global frameworks for realising the benefits of commercial mining without creating disparity between nations and disrupting dynamics of the world economy.

Attribution: Senjuti Mallick and Rajeswari Pillai Rajagopalan, “*If Space is 'the Province of Mankind', Who Owns its Resources? The Potential of Space Mining and its Legal Implications*”, *ORF Occasional Paper No. 182*, January 2019, Observer Research Foundation.

## INTRODUCTION

June 2018 marked the golden jubilee of the first United Nations (UN) Conference on the Exploration and Peaceful Uses of Outer Space, held in Vienna in 1968. It also marked 51 years of the Outer Space Treaty (OST) of 1967. Today, what was once fodder for cosmological science fiction has become reality, owing to outer-space innovations that have happened in the last half a century. Unlike the lunar missions of the past, contemporary explorations are led mostly by private-sector entities eager to capitalise on the potential of extracting resources in outer space. How plausible is extraterrestrial mining—is it a long-term proposition or more of a fantasy? And what challenges are facing those engaged in space mining?

Soon after a bill was signed increasing the 2018 budget for NASA (the US' National Aeronautics and Space Administration),<sup>1</sup> Senator Ted Cruz said, "I'll make a prediction right now—the first trillionaire will be made in space."<sup>2</sup> The question is, however, how those trillionaires will make their riches from space. Both Peter Diamandis (founder of the Google Lunar XPrize competition)<sup>#</sup> and Neil deGrasse Tyson (US astrophysicist) suggest that the financial returns are to be made from mining/asteroids.<sup>3</sup>

Indeed, the economic imperative for space mining is evident and analysts predict that these extraction activities could translate to a multibillion-dollar industry. NASA estimates, for example, that the value of asteroids out there could be in the vicinity of US\$700 quintillion – that amount is roughly equivalent to US\$95 billion for each of us here on Earth.<sup>4</sup> Another major attraction for the prospective extraterrestrial

---

# The Google Lunar XPrize, sometimes also called the Moon 2.0, was a space competition instituted during 2007-18, calling upon privately funded teams to land a robotic spacecraft on the Moon, travel 500 metres and transmit back to Earth high-definition video and images. The completion was sponsored by Google. For more details, see Lunar XPrize, <https://lunar.xprize.org/prizes/lunar>

mining companies is the availability of precious minerals in abundance on the Moon, on Mars and the asteroids (among them—lithium, cobalt, nickel, copper, zinc, niobium, molybdenum, lanthanum, europium, tungsten, and gold).<sup>5</sup> After all, these metals and mineral resources have grown scarce on Earth, and both governments and commercial actors are pushing to look to celestial bodies for resources.<sup>6</sup>

This paper examines the legal and governance basis for States and commercial players to undertake space mining activities. It does not, however, cover the technical aspects of space mining; that is a separate field by itself. The first section discusses the rationale for different stakeholders in undertaking extraterrestrial mining. So far, the countries most eager and making the most active preparations for space mining are the US and—surprisingly, as it has not been typically a spacefaring nation—Luxembourg. This section will detail these efforts as well as those of other countries planning to follow the path being paved by these two. The second section then examines the legal basis for space mining, covering provisions of national and international law. The subsequent section looks at the global policy discourse responses from other governments to proposals and preparations for space mining, primarily Russia and China. The paper concludes by summarising the global governance challenges that are brought about by space mining activities.

## WHY MINING?

Technological innovation—primarily brought about by commercial players such as Elon Musk<sup>^</sup> and Jeff Bezos<sup>\*</sup>—is changing the landscape of space exploration. Leading the way in this new-era race are the startups

---

<sup>^</sup> Elon Musk is the founder, CEO, and lead designer of SpaceX, an American aerospace company focused on manufacturing and space transportation services and CEO of Tesla Motors, an American automotive and energy company specialising in electric car manufacturing.

<sup>\*</sup> Jeffrey Bezos is an American technology entrepreneur and investor, founder and CEO of Amazon.com and owner of *The Washington Post*.

including Planetary Resources, Deep Space Industries, Ispace, and Kleos Space.<sup>7</sup> Research into the feasibility of human and robotic missions to asteroids is being conducted by both governmental organisations, like NASA and JAXA (Japan Aerospace Exploration Agency), as well as private companies such as Planetary Resources.<sup>8</sup> However, for realising affordable space travel and space industrialisation, it is essential to find extraterrestrial materials such as metals, minerals and water that do not have to be transported from Earth. Thus, the first objective in carrying out asteroid mining activity is to obtain elements that are critical for basic sustenance on Earth. It has been identified that the asteroid belt in our solar system contains eight-percent metal-rich (M type) asteroids and 75-percent volatile-rich carbonaceous (C type) asteroids.<sup>9</sup>

The second incentive for celestial mining companies is to haul precious minerals and cargo raw materials to Earth to fuel its fast depleting resources. This would significantly increase the mining company's valuation and greatly impact the global economy. According to a 2012 *Reuters* interview with Planetary Resources, a 30-meter-long (98-foot) asteroid can hold platinum worth somewhere from US\$25 billion to US\$50 billion.<sup>10</sup> These metals are highly useful and valuable, both on Earth and in space.<sup>11</sup>

Third, asteroids give humans the potential to create tools in space, since iron, nickel and cobalt are in abundance.<sup>12</sup> Chris Lewicki, Planetary Resources CEO, has said, "Using 3D printing technology one can grab material off asteroids and 3D print something that never has to be on a rocket. Tools, machines and even habitats can then be built off Earth, reducing the cost of exploration even further."<sup>13</sup> Fourth, resource extraction is also becoming a focus for many Middle Eastern nations.<sup>14</sup> The Middle Eastern oil States, such as Saudi Arabia and the United Arab Emirates are investing heavily in this industry as they are looking at space as a way to diversify out of the earthly benefits of fossil fuel.<sup>15</sup>

Fifth, countries such as India and China are looking to mine the Moon for extracting Helium-3, which is considered a clean and efficient form of energy. It is thought that this isotope could provide safer nuclear energy in a fusion reactor, since it is not radioactive and would not produce dangerous waste products.<sup>16</sup>

Finally, the water available in outer space could be used to make rocket propellants. According to scientists, since water is abundant in outer space, in some or the other form, it could be extracted and electrolysed to derive hydrogen and oxygen, the key ingredients of rocket fuel.<sup>17</sup> Thus, instead of carrying one's own fuel all the way, asteroids could serve as extraterrestrial/orbital "gas stations" for fuelling future deep space missions. This would simultaneously make space travel more cost-effective and productive. Such ventures are also seen to be intrinsic to further science and discovery, in addition to revolutionising commercial development in outer space. The mining of asteroids could also provide a near-infinite supply of the precious resources for Earth to use.<sup>18</sup>

Despite being a potentially lucrative business, however, asteroid mining poses various technical challenges. According to a study by the Keck Institute for Space Studies (KISS), the cost for a future mission to identify and return a 500-tonne asteroid to low earth orbit is US\$2.6 billion (excluding the costs to develop the necessary infrastructure for processing the materials in the asteroid).<sup>19</sup> While this may be a hefty amount, Goldman Sachs's 2017 report argues that an investment of US\$2.6 billion in spacecraft is in fact less than one-third of what has been invested in the car-sharing system, Uber.<sup>20</sup> The report thus theorised that the barriers to space mining have less to do with the possibility of its realisation at a technical level, and more with making the enterprise cost-effective.<sup>21</sup> While arguing that "space mining could be more realistic than perceived," the same report contends that it is the



“psychological barriers” to asteroid mining that are still high, whereas, the “financial and technological barriers are far lower.”<sup>22</sup>

Another critique of outer space mining is that the extraction of precious metals, such as platinum, would adversely impact the global economy. A sudden and abundant availability of platinum (which is a rare commodity on Earth) would make the price of platinum drop remarkably, in turn affecting its overall value.<sup>23</sup> An alternative perspective suggests that, considering the current valuation of platinum, once the proper infrastructure is set up, the probability of significant profits goes high.<sup>24</sup> Notwithstanding the contrary viewpoints, it is believed that the scientific and engineering challenges of asteroid mining are completely surmountable<sup>25</sup> and a future where the metals, rock and water that we mine in space are used either in space or Earth, or both, is more achievable.<sup>26</sup>

Although cost and scientific progress are sizeable impediments for mining to become economically and technologically feasible, the most pressing of them all is the legal factor. For example, who really *owns* asteroids? Can anyone simply venture into outer space with a flag and stake a claim? Asking these questions becomes pertinent especially when companies are looking to earn profits beyond the Earth's precincts.

## LEGAL BASIS FOR SPACE MINING

The first concern is establishing clear regulations regarding asteroid mining. With an intent to establish clear regulations with respect to asteroid mining and to legalise material extraction from the moon and other celestial bodies by private companies in the US, the US government legalised space mining in 2015 by introducing the US Commercial Space Launch Competitiveness Act, 2015.<sup>27</sup> This move was

heartily welcomed by the private companies as it provided legitimacy to their planned activities. Subsequently in 2017, Luxembourg followed suit.<sup>28</sup> While the US has been a spacefaring nation for many decades now, Luxembourg aspires to become a global leader in the nascent race to mine resources in outer space. In the 1980s the tiny European nation arose out of almost nowhere to become a leader in the satellite communications industry; today it is looking to the skies again, hoping to be the Silicon Valley of asteroid mining.<sup>29</sup> In the backdrop of a thriving steel industry that faced trade recession during the oil crisis of 1973, Luxembourg is trying to capitalise on the potential of space mining. As Prime Minister Xavier Bettel put it, “We realized it wouldn’t be forever, the steel, so we decided to do other things.”<sup>30</sup> Similarly, looking beyond oil, the UAE is framing its policy approaches to make advances in two key areas: human space exploration, and commercial activities of resource extraction through mining.<sup>31</sup>

The two formal pieces of legislation (passed by the US and Luxembourg) provide an answer to the complex question of ownership in outer space; the two-word answer appears to be, “finders, keepers”. The US Commercial Space Launch Competitiveness Act, 2015 states: “A US citizen engaged in commercial recovery of an asteroid resource or a space resource shall be entitled to any asteroid resource or space resource obtained.”<sup>32</sup> This legislation gives US space firms the right to own, keep, use, and sell the spoils of the cosmos as they deem fit. Luxembourg’s legislation is fairly analogous to the US Act, giving mining companies the right to keep their plunder. However, unlike the US law, Luxembourg’s does not require a company’s major stakeholders to be based in the country to enjoy its safeguards; the only requirement is for that company to have an office in the country.<sup>33</sup> In 2017, Japan entered into a five-year agreement with Luxembourg for mining operations in celestial bodies. Japan today appears a step closer to realising its objective of asteroid mining with two Japanese rovers, Minerva II-1, of

JAXA landing on the surface of the asteroid named Ryugu in September 2018.<sup>34</sup> Earlier, Portugal and the UAE signed similar cooperation agreements with Luxembourg.<sup>35</sup>

Meanwhile, a few other countries—which have been critical of the US and Luxembourg, at the forefront of the space mining efforts—have also decided to join the field. The increasingly competitive and contested nature of outer space activities is spurring major spacefaring nations to push the boundaries in their space exploration. Asteroid mining could possibly become the next big thing and is already seeing a race among the space powers. The US and Luxembourg are at the forefront in space resource extraction in terms of the policy frameworks and funding.<sup>36</sup> Even as the US has clarified that the US Space Act 2015 is being misunderstood and that there is no change in the US policy towards national appropriation of space, the reality is that it has already spurred a major debate.<sup>37</sup>

China and Russia are among those countries that are following on the path of the US and Luxembourg in undertaking mining missions in space. According to media reports, Ye Peijian, chief commander and designer of China's lunar exploration programme has stated that China would send the first batch of asteroid exploration spacecraft around 2020.<sup>38</sup> Speaking to China's Ministry of Science and Technology-run newspaper, *Science and Technology Daily*, Ye said that these asteroids have a high concentration of precious metals, which could rationalise the huge cost and risks involved in these activities as their economic value could run into the trillions of US dollars. Therefore, extraction, mining and transporting them back to Earth through robotic equipment will be a significant activity. Chinese scientists are working on missions to “bring back a whole asteroid weighing several hundred tonnes, which could turn asteroids with a potential threat to Earth into usable resources.”<sup>39</sup> Ye was also quoted as saying that China has plans of “using

an asteroid as the base for a permanent space station.”<sup>40</sup> Helium mining on the moon is also part of China’s goals.<sup>41</sup>

Russia, for its part, is also responding to the space-mining developments of the last decade. For one, it plans to have a permanent lunar base somewhere between 2015 and 2020 for possible extraction of Helium.<sup>42</sup> Even as Russia’s official position on asteroid mining is that it is forbidden under the 1967 OST—which states that space is the “province of mankind”—the Russian industry players are of the view that they must follow the lead taken by the US and Luxembourg.<sup>43</sup> In early 2018, the director of the Scientific-Educational Center for Innovative Mining Technologies of the Moscow-based National University of Science and Technology MISIS (NUST MISIS), Pavel Ananyev, spoke about the Russian ambitions and proposed activities including space drilling rigs, water extraction on the Moon and 3D printers at space stations.<sup>44</sup> Russia’s private space companies including Dauria Aerospace, one of the first Russian private space companies, also hold the opinion that they must go forward in the same direction and call for a larger space to private sector to engage in extracting space resources.<sup>45</sup> Moscow may not have yet actively pursued space mining and resource extraction, but it is likely to pick up pace in the coming years alongside global efforts. Moscow clearly has a capacity gap in terms of funding because its earlier plans to have a permanent base in the Moon by 2015 is yet to happen.

India, too, has ambitions in extraterrestrial resource extraction. In fact, a year after the US legislation, Prabhat Ranjan, executive director of Technology Information, Forecasting and Assessment Council (TIFAC), a policy organisation within the Department of Science and Technology, made a case for India to push ahead with lunar and asteroid mining. He said, “Moon is already being seen as a mineral wealth and further one can go up to the asteroids and start exploiting this. This can be a big

game changer and if India doesn't do this, we will lag behind."<sup>46</sup> More recently, Dr. K Sivan, Chairman of the country's civil space organisation, Indian Space Research Organisation (ISRO), talked about ISRO's plans for helium-3 extraction and said, "the countries which have the capacity to bring that source from the moon to Earth will dictate the process. I don't want to be just a part of them, I want to lead them."<sup>47</sup> However, gaining proficiency in such missions is not easy – the NASA and ESA (the European Space Agency) have been discussing these possibilities for a longer time, albeit quietly. The ISRO Chairman's response was characterised by an Indian commentator as "aspirational" and "emotional", clearly conceding that the country's technological wherewithal is yet to be adequate.<sup>48</sup>

Importantly, it is not clear how the legal and regulatory aspects of space mining operations are being dealt with. There was one instance, though, when Luxembourg and Japan in a joint press statement said, "The exchange of information may cover all the issues of the exploration and commercial utilization of space resources, including legal, regulatory, technological, economic, and other aspects."<sup>49</sup> Whether such legalisation is truly *legal* is arguable.

## **SPACE MINING: LEGAL OR NOT?**

The Outer Space Treaty (OST) of 1967, considered the global foundation of the outer space legal regime, along with the other four associated international instruments have provided the fundamental basis for outer space activities by prohibiting certain activities and emphasising aspects such as the "common heritage of mankind". These agreements have been useful in highlighting the global common nature of outer space. At the same time, however, they have been insufficient and ambiguous in providing clear regulations to newer space activities such as asteroid mining.

Based on the premise of '*res communis*', the magna carta of space law, the OST, illustrates outer space as "the province of all mankind".<sup>50</sup> Under Article I, States are free to explore and use outer space and to access all celestial bodies "on the basis of equality and in accordance with international law."<sup>51</sup> Although the OST does not explicitly mention "mining" activities, under Article II, outer space including the Moon and other celestial bodies are "not subject to national appropriation by claim of sovereignty" through use, occupation or any other means.<sup>52</sup> Furthermore, the Moon Agreement, 1979, not only defines outer space as "common heritage of mankind" but also proscribes commercial exploitation of planets and asteroids by States unless an international regime is established to govern such activities for "rational management," "equitable sharing" and "expansion of opportunities" in the use of these resources.<sup>53</sup>

Slipping conveniently through the loophole in the OST, both the US and Luxembourg have authorised companies to claim exclusive ownership over extracted resources (but not of the asteroid itself). Proponents argue that since no sovereign nation is actually asserting rights over an area of outer space, instead, it is only a private unit claiming rights over singular resources, the treaty norm, "national appropriation by claim of sovereignty", is not being violated. In the words of renowned space lawyer, Frans von der Dunk, "In terms of the law, yes it's true that no country can claim any part of outer space as national territory — but that doesn't mean private industry can't mine resources."<sup>54</sup> Quoting reference from maritime law, Luxembourg regards space resources as appropriable akin to fish and shellfish, but celestial bodies and asteroids are not, just like the high sea. It is noteworthy that out of the only 18 nations that have ratified the Moon Agreement,<sup>55</sup> none are major spacefaring nations, thereby giving themselves a convenient leeway to not abide by the same.

These unilateral initiatives have set off a critical response from the international community. Applying literal interpretation of the OST, there is certainly room to construe that space mining may be legal, compared to the Moon Agreement whose prohibition is absolute. However, taking into consideration the letter and spirit of the OST, strengthened by the Moon Agreement, the argument that “national appropriation” only extends to appropriation of territory and not appropriation of resources is a far reach. That resource extraction is contemplated, albeit implicitly, in the OST, is nothing but logical. Not only have such claims of possessory rights not been recognised in the past, there is also global consensus regarding its illegality.<sup>56</sup> It therefore forms a part of customary international law, despite the Moon Agreement not having been widely ratified. In this light, the legalisation of space mining is a sheer violation of the elemental principles of international space law. Yet, there is no clarity on what activity is allowed and what is prohibited in outer space under the existing law.<sup>57</sup> There is ambiguity around most issues—from “who would license and regulate asteroid mining operations” to the legality of these activities as per the existing international space law.<sup>58</sup>

When comparing it to the law of the seas, resource appropriation in the high seas and deep seabed is governed by the United Nations Convention on the Law of the Sea (UNCLOS), 1982, and that in Antarctica, as per the Protocol on Environmental Protection to the Antarctic Treaty, 1991. While the former is strictly regulated under Part XI of UNCLOS, the latter is completely forbidden but for scientific purposes. The law of the sea argument—“owning the fish, not the sea”—cannot be applied to outer space primarily because fish are living resources that can reproduce and therefore are renewable. Outer space resources, on the other hand, are depletable: once harvested, they cannot be replenished. The analogy with fish and seas, therefore, is not a fair one and its transposition to outer space and celestial bodies would be inaccurate.

Perhaps a more comparable regime is the deep seabed, which contemplates property rights over mineral extraction. The utilisation and ownership of the deep seabed's resources are exclusively structured around the International Seabed Authority (ISA), which is responsible for organising, carrying out and controlling all activities in the seabed.<sup>59</sup> Not only must State parties seek sanction from the ISA before beginning resource exploitation, but the fiscal benefits from seabed mining must also be shared among all.<sup>60</sup> Evidently, even the UNCLOS upholds State ownership and fair distribution over individual ownership and self-centred gains.<sup>61</sup> By allowing private ownership, the US and Luxembourg are once again in contravention of the very same law they are relying on. The touchstone principle, "province of all mankind" is also being defeated. Therefore, to even reap the limited benefits as under UNCLOS, at least the derivation must be made alike. This argument too falls flat.

## THE WAY AHEAD

Undoubtedly, growing technological adeptness has made space mining inevitable and, therefore, the question is no longer "if" but "when". Nevertheless, a scenario where companies can, solely based on domestic laws, steadily exploit mineral resources in outer space, would be universally unacceptable. Minus regulations, the realisation of space exploitation will create great disparity between nations and disrupt dynamics of the world economy. Regulations are particularly important in the context of the space debris problem. We definitely do not wish for a future, befittingly described by renowned engineer and inventor Graham Hawkes, thus: "Space exploration promised us alien life, lucrative planetary mining, and fabulous lunar colonies. News flash, ladies and gents: Space is nearly empty. It's a sterile vacuum, filled mostly with the junk we put up there."<sup>62</sup> Therefore, it is extremely important that resource appropriation is carried out in an ethical



manner, without interrupting safe and secure access to outer space, simultaneously allowing all countries a share in the proceeds.

Technological advances and financial readiness are pushing both, states and non-state players towards new ventures in outer space. Yet, the rules of engagement especially dealing with the new commercial activities are far from ideal. There is a clear and urgent need to debate and come up with either a new regulation or accommodate the space mining activities within the existing international legal measures. Experts have articulated that these could possibly be addressed under the existing property law principles or old mining law principles.<sup>63</sup> However, given the scale of activities that states and non-state parties will engage in, the ability of the existing regime to address space mining could be highly inadequate.

The second option would be to develop a new instrument including an institutional architecture that would set out the parameters for activities related to resource extraction and space mining. Since there are a good number of commercial players playing a formidable role in asteroid mining, there has to be space for commercial players in the new gig, which might be a big departure from the earlier era institutions that saw states being the sole authority in regulating activities in outer space. A clear role for commercial players has been articulated for some time but the global space community has yet to reach a consensus in how they can be incorporated into the global governance debates. The apprehension on the part of a number of states is driven by the fact that private sector participation is still largely a western phenomenon. This trend may be undergoing change in other parts of the world but until there is a sizeable private sector community in other major spacefaring powers, there is a fear that the western bloc of countries may stand to gain from the industry being represented in the global governance debates.


A third possible option is to get a larger global endorsement of the Moon Treaty, which highlights the common heritage of mankind. The Moon Treaty is important as it addresses a “loophole” of the OST “by banning any ownership of any extraterrestrial property by any organization or private person, unless that organization is international and governmental.”<sup>64</sup> But the fact that it has been endorsed only by a handful of countries makes it a “failure” from the international law perspective.<sup>65</sup> Nevertheless, efforts must be made to strengthen the support base for the Moon Agreement given the potential pitfalls of resource extraction and space mining activities in outer space. Signatories to the Moon Treaty can take the lead within multilateral platforms such as the UN to debate the usefulness of the treaty in the changed context of technological advancements and new geopolitical dynamics, and potentially find compromises where there are disagreements.

Pursuing a collective approach is ideal. An example is UNCLOS, which demonstrates that the international society possesses the capability of regulating mining quarters deemed to be the “province of mankind”. However, a *sui generis* legal framework must be crafted because the difference between the marines and outer space and their resources is wide, and the regulations are too region-specific to permit a superimposition of the oceanic regime to outer space. A sound legal environment will protect both the company performing operations and its beneficiaries, while ensuring even-handed resource allocation. In addition, regulations spelling out safety standards and identifying safety zones around mining operations could be useful in ensuring safe and secure operations in outer space.

It would be wrong, however, to say that the international community has not debated over this. In fact, one of the main agenda points of the fifty-seventh session of UNCOPUS Legal Committee held in April 2018,

was especially devoted to “general exchange of views on potential legal models for activities in the exploration, exploitation and utilization of space resources.”<sup>66</sup> Upon evaluation, it is clear that countries are not against space mining as such; rather the contentious points are vis-à-vis authorisation, regulation, and where to place responsibility. There also appears to be concurrence regarding the need for international coordination efforts of some sort. Over the last two years, The Hague Space Resources Governance Working Group,<sup>67</sup> established with the purpose of “assess[ing] the need for a regulatory framework for space resource activities, has identified 19 “building blocks”,<sup>68</sup> encompassing subject matters that could be included in such a regulatory framework. Although this leaves a lot of hope for the legitimate mining of space resources, its status is still pending. Also, several questions need to be agreed upon by the global space policy community before the establishment of a framework. First, there must be an agreement among all the space powers on the need for a global governance framework for the use of space resources. This must be followed by detailed deliberations on the scope, mandate and objectives of such a framework. Can and should there be safety zones and exclusive rights be recognised under such a framework and how one can ensure equitable sharing of the resources, and lastly, the role of industries and how the interests of the industry as pioneers in this area can be secured. These are all pertinent questions that need to be considered and debated before an international regime for extraction and use of space resources can be established.<sup>69</sup> Even legal space mining activity could have serious impacts in two ways. For instance, any technological spinoffs that a country might have could add to the space weaponisation debate. Two, the erosion of norms with regard to space mining could have a cascading effect on other norms in the same issue area such as weaponisation of space.

It is imperative for nations to actively combine their efforts to ensure that this activity transpires in the most globally acceptable

manner and not one which stirs anarchism. The ancient Roman maxim, '*Quod omnes tangit ab omnibus approbatur*' (What touches all must be approved by all) gains due traction in this kind of a scenario. Therefore, a universal activity like space exploration mandates an international guideline; or else, the first haul from mining, instead of earning admiration and exultation, will only be enmeshed in litigation. 

## ENDNOTES

1. “New Space Policy Directive Calls for Human Expansion Across Solar System,” NASA, 12 December 2017, <https://www.nasa.gov/press-release/new-space-policy-directive-calls-for-human-expansion-across-solar-system>
2. Andrew Glester, “The asteroid trillionaires”, *Physics World*, 11 June 2018, <https://physicsworld.com/a/the-asteroid-trillionaires/>, <https://physicsworld.com/a/the-asteroid-trillionaires/>
3. Ibid.; Andrew Zaleski, “Luxembourg leads the trillion-dollar race to become the Silicon Valley of asteroid mining”, *CNBC*, 16 April 2018, <https://www.cnn.com/2018/04/16/luxembourg-vies-to-become-the-silicon-valley-of-asteroid-mining.html>
4. Karen Graham, “The race for asteroid-mining worth trillions is on”, *Digital Journal*, 11 June 2018, <http://www.digitaljournal.com/tech-and-science/technology/the-race-for-space-is-on-think-asteroid-mining-worth-trillions/article/524405>; Statement of Dr. George C Nield, Associate Administrator for Commercial Space Transportation of the Federal Aviation Administration, before the House Subcommittee on Space and Aeronautics
5. Wilmer Giraldo and Jorge Ivan Tobon, “Extraterrestrial Minerals and Future Frontiers in Mineral Exploration,” *DYNA*, 80:182, pp. 83-87, [http://www.scielo.org.co/scielo.php?script=sci\\_arttext&pid=S0012-73532013000600010&lng=en&tlng=es](http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0012-73532013000600010&lng=en&tlng=es)
6. Gueric de Crombrughe (Business Development Manager at SABCA), “Asteroid mining as a necessary answer to mineral scarcity,” LinkedIn, 11 January 2018, <https://www.linkedin.com/pulse/asteroid-mining-necessary-answer-mineral-scarcity-de-crombrughe/>
7. There are also state agencies such as the US Geological Survey that are beginning to approach space resource mining with a lot more seriousness. See Leonard David, “The US Geological Survey Is Getting Serious About Space Resources and Mining,” *www.space.com*, 4 September 2018, <https://www.space.com/41707-space-mining-usgs-resource-survey.html>; Zoë Corbyn, “The asteroid rush sending 21st-century prospectors into space,” *The Guardian*, 9 June 2018, <https://www.theguardian.com/science/2018/jun/09/asteroid-mining-space-prospectors-precious-resources-fuelling-future-among-stars>
8. Mission 2016: The Future of Strategic Natural Resources, MIT, <http://web.mit.edu/12.000/www/m2016/finalwebsite/solutions/asteroids.html>
9. Ibid.

10. Irene Klotz, "Tech billionaires bankroll gold rush to mine asteroids", *Reuters*, 24 April 2012, <https://www.reuters.com/article/us-space-asteroid-mining/tech-billionaires-bankroll-gold-rush-to-mine-asteroids-idUSBRE83N06U20120424>
11. As of January 2019, platinum was priced at \$795.50 per unit. 'Platinum' <https://markets.businessinsider.com/commodities/platinum-price> accessed 1 January 2019
12. Sarah Cruddas, "Could the untold riches in asteroids and other planets be the key to exploring the wider Universe?", *BBC*, 5 January 2016, [www.bbc.com/future/story/20160103-the-truth-about-asteroid-mining](http://www.bbc.com/future/story/20160103-the-truth-about-asteroid-mining)
13. *Ibid.*
14. Mohamed Al Ahbabi, The UAE Space Programme, UAE Space Agency, <https://www.icao.int/Meetings/SPACE2016/Presentations/1e%20-%20M.%20AlAhbabi%20-%20Welcome%20Remarks%20-%20UAE%20Space%20Agency.pdf>; Lucy Bernard, "UAE to finalise space laws soon, *The National* , 7 March 2016, <https://www.thenational.ae/business/uae-to-finalise-space-laws-soon-1.219966>
15. Thomas Heath, "Space-mining may be only a decade away. Really.", *The Washington Post*, 28 April 2017, [https://www.washingtonpost.com/business/space-mining-may-be-only-a-decade-away-really/2017/04/28/df33b31a-29ee-11e7-a616-d7c8a68c1a66\\_story.html?noredirect=on&utm\\_term=.6a3693902deb](https://www.washingtonpost.com/business/space-mining-may-be-only-a-decade-away-really/2017/04/28/df33b31a-29ee-11e7-a616-d7c8a68c1a66_story.html?noredirect=on&utm_term=.6a3693902deb)
16. Utpal Bhaskar, "Isro plans to mine energy from Moon by 2030 to help meet India needs," *LiveMint*, 21 April 2017, <https://www.livemint.com/Science/W5WjJCdqxXYpHvrB2TTHP/Isro-plans-to-mine-energy-from-Moon-by-2030-to-help-meet-Ind.html>; Helium-3 mining on the Lunar surface, ESA, [https://www.esa.int/Our\\_Activities/Preparing\\_for\\_the\\_Future/Space\\_for\\_Earth/Energy/Helium-3\\_mining\\_on\\_the\\_lunar\\_surface](https://www.esa.int/Our_Activities/Preparing_for_the_Future/Space_for_Earth/Energy/Helium-3_mining_on_the_lunar_surface), *Bloomberg*, 26 June 2018, <https://www.bloomberg.com/news/articles/2018-06-26/the-quest-to-find-a-trillion-dollar-nuclear-fuel-on-the-moon>
17. Jesse Dunietz, "Floating Treasure: Space Law Needs To Catch Up With Asteroid Mining", *Scientific American*, 28 August 2017, [https://www.esa.int/Our\\_Activities/Preparing\\_for\\_the\\_Future/Space\\_for\\_Earth/Energy/Helium-3\\_mining\\_on\\_the\\_lunar\\_surface](https://www.esa.int/Our_Activities/Preparing_for_the_Future/Space_for_Earth/Energy/Helium-3_mining_on_the_lunar_surface); Preston Dyches, Felicia Chou, "The Solar System and Beyond is Awash in Water", NASA Official, 7 April 2015, <https://www.nasa.gov/jpl/the-solar-system-and-beyond-is-awash-in-water>; Loren Grush, "Why mining the water on the Moon could open up space

exploration”, *The Verge*, 23 August 2018, <https://www.theverge.com/2018/8/23/17769034/nasa-moon-lunar-water-ice-mining-propellant-depots>

18. Mark Molly, “Asteroid mining made legal after passing of ‘historic’ space bill in US”, *The Telegraph*, 26 November 2015, <https://www.telegraph.co.uk/news/worldnews/northamerica/usa/12019740/Who-owns-space-Asteroid-mining-made-legal-in-US-after-passing-of-2015-space-bill.html>
19. MIT, *supra* note 5
20. Adam Mann, “Who’s in Charge of Outer Space?”, *Wall Street Journal*, 19 May 2017, <https://www.wsj.com/articles/whos-in-charge-of-outer-space-1495195097?mod=e2twd>
21. Scot W. Anderson, Korey Christensen & Julia LaManna, *The development of natural resources in outer space*, *Journal of Energy & Natural Resources Law*, *Journal of Energy & Natural Resources Law*, 2018, <https://doi.org/10.1080/02646811.2018.1507343>
22. Jim Edwards, “Goldman Sachs: space-mining for platinum is ‘more realistic than perceived’” *The Business Insider* (UK), 6 April 2017, <https://www.businessinsider.com/goldman-sachs-space-mining-asteroid-platinum-2017-4?IR=T>
23. Andrew Glester, *supra* note 2
24. Andrew Zaleski, “How the space mining industry came down to Earth”, *Fortune*, 24 November 2018, <http://fortune.com/2018/11/24/asteroid-mining-space-planetary-resources/>
25. *Ibid.*
26. Scot W Anderson, *supra* note 18 <https://physicsworld.com/a/the-asteroid-trillionaires/>
27. One Hundred Fourteenth Congress of the United States of America “US Commercial Space Launch Competitiveness Act, 2015,” <https://www.gpo.gov/fdsys/pkg/BILLS-114hr2262enr/pdf/BILLS-114hr2262enr.pdf>
28. The Government of the Grand Duchy of Luxembourg, “Draft Law on The Exploration and Use of Space Resources,” 2017, <https://spaceresources.public.lu/content/dam/spaceresources/news/Translation%20Of%20The%20Draft%20Law.pdf>
29. Andrew Zaleski, *supra* note 3
30. Robert Mackenzie, “Why Luxembourg, of all places, is a global leader in asteroid mining”, *Motherboard Vice*, 26 December 2016, <https://motherboard.vice.com/>

en\_us/article/bmvkgm/why-luxembourg-of-all-places-is-a-global-leader-in-asteroid-mining

31. Lucy Barnard, "UAE to Finalise Space Laws Soon," *The National*, 7 March 2016, <http://www.thenational.ae/business/aviation/uae-to-finalise-space-laws-soon>
32. Sec. 51303 Asteroid resource and space resource rights - A United States citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States.
33. Law on the Exploration and Uses of Space Resources, 2017, Article 4 - The authorisation for a mission shall only be granted if the applicant is a public company limited by shares (société anonyme) or a corporate partnership limited by shares (société en commandite par actions) or a private limited liability company (société à responsabilité limitée) of Luxembourg law or a European Company (société européenne) having its registered office in Luxembourg and Article 7- (1). The authorisation shall be subject to the production of evidence showing the existence in Luxembourg of the central administration and of the registered office, including the administrative and accounting structures of the operator to be authorised (Translation of the Draft Law). For reference, <https://spaceresources.public.lu/content/dam/spaceresources/news/Translation%20Of%20The%20Draft%20Law.pdf> (English), <http://luxembourg.public.lu/fr/actualites/2016/11/11-space-resources/projet-de-loi-espace.pdf> (French); and <http://luxembourg.public.lu/en/actualites/2017/07/21-spaceresources/index.html> (official portal of Luxembourg).
34. Rachel O'Donoghue, "Space mining a step closer as Japan successfully lands rovers on ASTEROID," *The Daily Star* (UK), 22 September 2018, <https://www.dailystar.co.uk/news/weird-news/731536/japan-asteroid-rovers-space-mining-asteroids-spaceship>
35. "Luxembourg and the United Arab Emirates Sign MOU on Space Resources," [www.spaceresources.lu](http://www.spaceresources.lu), 10 October 2017, <https://spaceresources.public.lu/en/actualites/2017/MoU-UAE.html>; Cecilia Jamasmie, "Luxembourg, Japan team up to explore and mine space resources," [www.mining.com](http://www.mining.com), 29 November 2017, <http://www.mining.com/luxembourg-japan-team-explore-mine-space-resources/>
36. "H.R.2262 - 114th Congress (2015-2016): U.S. Commercial Space Launch Competitiveness Act," [www.congress.gov](http://www.congress.gov). 25 November 2015,



<https://www.congress.gov/bill/114th-congress/house-bill/2262>. The US also came out with an American Space Technology for Exploring Resource Opportunities In Deep Space Act or the ASTEROIDS Act that would “facilitate the commercial exploration and utilization of asteroid resources to meet national needs; discourage government barriers to the development of economically viable, safe, and stable industries for the exploration and utilization of asteroid resources in outer space in manners consistent with the existing international obligations of the United States; promote the right of U.S. commercial entities to explore and utilize resources from asteroids in outer space, in accordance with such obligations, free from harmful interference, and to transfer or sell such resources; and develop the frameworks necessary to meet the international obligations of the United States.” See “H.R.5063 - ASTEROIDS Act,” [www.congress.gov](http://www.congress.gov), 15 July 2014, <https://www.congress.gov/bill/113th-congress/house-bill/5063>; Andrew Zaleski, *supra* note 3 ; Mariella Moon, “Luxembourg’s asteroid mining law takes effect August 1st,” [www.engadget.com](http://www.engadget.com), 30 July 2017, <https://www.engadget.com/2017/07/30/luxembourg-asteroid-mining-law-august-1/>

37. For some of the global reactions to the US Space Act 2015, see Thomas Cheney, “Reactions to the US Space Act 2015: Statements at COPUOS,” <https://www.slideshare.net/thomcheney1991/reactions-to-the-us-space-act-2015-statements-at-copuos>
38. Stephen Chen, “China plans ambitious space mission to hunt and ‘capture’ asteroids by 2020,” *South China Morning Post*, 12 June 2017, <https://www.scmp.com/news/china/policies-politics/article/2093811/china-plans-ambitious-space-mission-hunt-and-capture>
39. “Capture an Asteroid, Bring it Back to Earth?,” Chinese Academy of Sciences, 24 July 2018, [http://english.cas.cn/newsroom/news/201807/t20180724\\_195396.shtml](http://english.cas.cn/newsroom/news/201807/t20180724_195396.shtml)
40. Stephen Chen, “China plans ambitious space mission to hunt and ‘capture’ asteroids by 2020,” *South China Morning Post*, 12 June 2017, <https://www.scmp.com/news/china/policies-politics/article/2093811/china-plans-ambitious-space-mission-hunt-and-capture>
41. Adrian Berry, “How China is sending man back to the Moon to mine safe nuclear power and become the world’s energy giant,” *The Telegraph*, 29 February 2016, <https://www.telegraph.co.uk/news/science/space/night-sky/12178122/night-sky-march-2016-china-space-mission.html>
42. “Russia to launch industrial mining of helium-3 on the Moon in 2020,” *Pravda*, 17 March 2006, <http://www.pravdareport.com/science/tech/17-03->

2006/77404-moon-0/; Mark Williams Pontin, "Mining the Moon," *MIT Technology Review*, 23 August 2007, <https://www.technologyreview.com/s/408558/mining-the-moon/>. More recent reports have given no timeline for its lunar base but Russia simply says it is pushing ahead with its plans for one. See "Putin builds space-weapon deterrent as Russia target Mars, moon," *TheRecord.com*, 12 April 2013, <https://www.therecord.com/news-story/2628809-putin-builds-space-weapon-deterrent-as-russia-target-mars-moon/>

43. Shura Collinson, "Asteroid mining: Russian experts call for action in the new space race," *www.skolkovo.com*, 20 October 2017, <https://sk.ru/news/b/articles/archive/2017/10/20/asteroid-mining-russian-experts-call-for-action-in-the-new-space-race.aspx>
44. "We Are Close to Extracting Water in Space - Russian Researcher," *Sputnik News*, 6 February 2018, <https://sputniknews.com/science/201802061061393101-russia-space-water-extraction/>
45. Shura Collinson, "Asteroid mining: Russian experts call for action in the new space race," *www.skolkovo.com*, 20 October 2017, <https://sk.ru/news/b/articles/archive/2017/10/20/asteroid-mining-russian-experts-call-for-action-in-the-new-space-race.aspx>
46. "India should not lag behind in outer space mining, TIFAC official says," *IANS*, 28 July 2016, <https://www.hindustantimes.com/tech/india-should-not-lag-behind-in-outer-space-mining-tifac-official-says/story-7ggXBzVbeILfGzHlW6FuRL.html>
47. Anurag Kotoky, "India prepares quest to find a trillion-dollar nuclear fuel on the Moon," *Hindustan Times*, 27 June 2018, <https://economictimes.indiatimes.com/news/science/india-prepares-quest-to-find-a-trillion-dollar-nuclear-fuel-on-the-moon/articleshow/64760124.cms>
48. Vasudevan Mukunth, "Why Are We Going Over the Moon on ISRO and Helium-3 All Over Again?," *The Wire*, 18 July 2018, <https://thewire.in/the-sciences/why-are-we-going-over-the-moon-on-helium-3-all-over-again>
49. The Government of the Grand Duchy of Luxembourg, "Press Release - Luxembourg and Japan agree to cooperate on exploration and commercial utilization of space resources," 29 November 2017, <https://spaceresources.public.lu/dam-assets/press-release/2017/2017-11-29-press-release-mou-japan-space.pdf>
50. Article I – "The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."

51. Article I – “Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.”
52. Article II – “Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.”
53. Article XI - The moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement and in particular in paragraph 5 of this article. Para 7 clearly specifies the main role and purpose of the international regime that must be set up to govern such activities, which include: “(a) The orderly and safe development of the natural resources of the moon; (b) The rational management of those resources; (c) The expansion of opportunities in the use of those resources; (d) An equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the moon, shall be given special consideration.” See “The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies,” 1979, [http://www.unoosa.org/pdf/gares/ARES\\_34\\_68E.pdf](http://www.unoosa.org/pdf/gares/ARES_34_68E.pdf)
54. Statement by Frans von der Dunk to *The Inverse*, ‘Luxembourg’s Asteroid Mining is Legal Says Space Law Expert’, 1 August 2017, <https://www.inverse.com/article/34935-luxembourg-s-asteroid-mining-is-legal-says-space-law-expert>
55. United Nations Treaty Collections, Chapter XXIV, Outer Space, [https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg\\_no=XXIV-2&chapter=24&clang=\\_en](https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXIV-2&chapter=24&clang=_en)
56. For some of these debates, see James E Dunstan, “Mining outer space may be cool but is it legal?,” *Room – the Space Journal*, <https://room.eu.com/article/mining-outer-space-may-be-cool-but-is-it-legal>
57. Leonard David, “Mining the Moon? Space Property Rights Still Unclear, Experts Say,” [www.space.com](http://www.space.com), 25 July 2014, <https://www.space.com/26644-moon-asteroids-resources-space-law.html>; for some of the ambiguities in the existing international measures, see Scot W Anderson, Korey Christensen & Julia LaManna, “The development of natural resources in outer space,” *Journal of Energy & Natural Resources Law*, 2018, [https://www.hoganlovells.com/~media/hogan-lovells/pdf/2018/the\\_development\\_of\\_natural\\_resouces\\_in\\_outer\\_space\\_august\\_2018.pdf](https://www.hoganlovells.com/~media/hogan-lovells/pdf/2018/the_development_of_natural_resouces_in_outer_space_august_2018.pdf); Jinyuan Su, “Legality of Unilateral Exploitation of Space Resources Under International Law,” *International and Comparative Law*

*Quarterly*, 2017, <https://www.cambridge.org/core/journals/international-and-comparative-law-quarterly/article/legality-of-unilateral-exploitation-of-space-resources-under-international-law/EE17641F7B7C6404A79B77AEB627D5F4>

58. Jon Kelvey, "Is It Legal to Mine Asteroids?," *www.slate.com*, 13 October 2014, [http://www.slate.com/articles/health\\_and\\_science/space\\_20/2014/10/asteroid\\_mining\\_and\\_space\\_law\\_who\\_gets\\_to\\_profit\\_from\\_outer\\_space\\_platinum.html](http://www.slate.com/articles/health_and_science/space_20/2014/10/asteroid_mining_and_space_law_who_gets_to_profit_from_outer_space_platinum.html)
59. United Nations, "UNCLOS, Part XI, Section 4 – The Authority," [http://www.un.org/Depts/los/convention\\_agreements/texts/unclos/part11-4.htm](http://www.un.org/Depts/los/convention_agreements/texts/unclos/part11-4.htm)
60. "The International Seabed Mining Authority and Deep Seabed Mining", Volume LIV Nos. 1 & 2 2017, May 2017, UN Chronicle, <https://unchronicle.un.org/article/international-seabed-authority-and-deep-seabed-mining>
61. United Nations Convention on the Law of the Sea, Article 140 (1) Activities in the Area shall, as specifically provided for in this Part, be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States, whether coastal or land-locked, and taking into particular consideration the interests and needs of developing States and of peoples who have not attained full independence or other self-governing status recognized by the United Nations, (2) The Authority shall provide for the equitable sharing of financial and other economic benefits derived from activities in the Area through any appropriate mechanism, on a non-discriminatory basis.
62. Graham S. Hawkes, "Go Deep!," *Wired*, March 1, 2003, <https://www.wired.com/2003/03/go-deep/>
63. Priyank D. Doshi, "Regulating The Final Frontier: Asteroid Mining and The Need For A New Regulatory Regime," *Notre Dame Journal of International & Comparative Law*, Vol. 6: Issue 1, 2016, <https://scholarship.law.nd.edu/cgi/viewcontent.cgi?article=1055&context=ndjicl>
64. Michael Listner, "The Moon Treaty: failed international law or waiting in the shadows?," *The Space Review*, 24 October 2011, <http://www.thespacereview.com/article/1954/1>
65. For a perspective on why the Moon Agreement has not gained sufficient traction, see Michael Listner, "The Moon Treaty: failed international law or waiting in the shadows?," *The Space Review*, 24 October 2011, <http://www.thespacereview.com/article/1954/1>
66. 'General exchange of views on potential legal models for activities in the exploration, exploitation and utilization of space resources', Report of the Legal

Subcommittee on its fifty-seventh session, held in Vienna from 9 to 20 April 2018, United Nations General Assembly. V.18-02816, p. 29 – 32

67. For more details on the Hague Space Resources Governance Working Group, see “The Hague International Space Resources Governance Working Group,” <https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-for-air-space-law/the-hague-space-resources-governance-working-group>
68. The Hague Space Resources Governance Working Group, Committee on the Peaceful Uses of Outer Space Legal Subcommittee, Fifty-seventh session, April 12, 2018, V.18-02277 (E), [http://www.unoosa.org/res/oosadoc/data/documents/2018/aac\\_105c\\_22018crp/aac\\_105c\\_22018crp\\_18\\_0\\_html/AC105\\_C2\\_2018\\_CRP18E.pdf](http://www.unoosa.org/res/oosadoc/data/documents/2018/aac_105c_22018crp/aac_105c_22018crp_18_0_html/AC105_C2_2018_CRP18E.pdf); The Draft Building Blocks can also be found at <https://media.leidenuniv.nl/legacy/draft-building-blocks.pdf>
69. Tanja Masson-Zwaan, “Governance of space mining activities and The Hague Working Group,” University of Tokyo, Japan, 4 March 2018, <http://stig.pp.u-tokyo.ac.jp/stig/wp-content/uploads/2018/02/Tanja.pdf>

**Observer Research Foundation (ORF)** is a public policy think tank that aims to influence the formulation of policies for building a strong and prosperous India. ORF pursues these goals by providing informed and productive inputs, in-depth research, and stimulating discussions. The Foundation is supported in its mission by a cross-section of India's leading public figures, including academic and business leaders.



**Ideas • Forums • Leadership • Impact**

---

20, Rouse Avenue Institutional Area, New Delhi - 110 002, INDIA

Ph. : +91-11-35332000 Fax : +91-11-35332005

E-mail: [contactus@orfonline.org](mailto:contactus@orfonline.org)

Website: [www.orfonline.org](http://www.orfonline.org)