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# Space Mining Emerging Future Legal Issue for Space Industry

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## ABSTRACT

*Mineral resources are oomph of the 1000 billion USD world economies. Scarcity in mineral resources brings with it, economic scarcity, both of which are a result of geological scarcity. The space mining explorations will lead to reorganization of the sector. The future of this sector and laws regulating asteroid mining are open to question. The present article is an attempt to make an assessment of such activities in the context of emerging legal issues that come along with commercial utilization of these resources. With the growing need for resources and such non-traditional missions, there will be difficulty in accessing the regulating legal aspects of space laws which results in scepticism.*

*U.S. and Luxembourg have given carte blanche to privately-owned entities to use space resources and operate independently (legal rights) in low earth orbit (eventually deep space) through their domestic laws which they say comply with the obligation under international law. Propensity still exists due to lack of maturity in space mining laws and these truancyof relevant norms or a statute and any office administering space mining activities. This would foment resource conflicts in outer space due to the rule of few. Propensity also lies in whether or not the use of outer space resources is authorised.*

*The Outer Space Treaty “prohibits states from owning celestial bodies by claims of sovereignty, use, occupation, or any other means”. Additionally, this treaty makes States answerable for the endeavours of government / private commercial organisations by authorising and administering such activities ad nauseam. This paper also deals with the preeminent principles of space law to determine the appropriateness of such emerging commercial mining practices and also their effect on the outer space environment and the economic development of the mining industry.*

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## I. INTRODUCTION

Planet Earth is the 5<sup>th</sup> largest globe in the solar system<sup>2</sup> with  $5.9722 \times 10^{24}$  Kg mass with colossal resources that can be extracted from the ocean, ground, and atmosphere. Rising populations brings with it, rising demand for resources. As the demand for invaluable natural resources increases, the potential for irreversible changes (in resources) which can have a long-lasting impact also increases. Human civilisations since archaic times have been capitalizing on resources, some of which are non-renewable and are available in defined quantity.

Since the industrial revolution, there has been advancement in the production and manufacturing sector. This has intensified the global resource extraction and planet earth is being exploited extensively without check.<sup>3</sup> This tendency of graspingness of resources has compelled both developed and developing nations to press into extra-terrestrial and space-based resources to rejuvenate their economy. The United States ‘Secretary of State said that “The Mediterranean is the ocean of the past, The Atlantic, the ocean of the present, And the Pacific, the ocean of the future”<sup>4</sup>, as these developing economies in Asia grow more, the demand of the resources grow with it and increases the utilization of extra-terrestrial and space based minerals.

Many countries have been focusing on expanding their reach to space to breathe a fresh life into their economy. I found the estimated global space economy was found to be \$345 billion USD in 2016 in a report by Bryce Space and Technology.<sup>5</sup> Of this total economic budget, three quarters were commercial revenue, and remaining was budget by governments. In the report, they mentioned it is also that close to 50 nations have \$1 billion budget and nearly 20 have under \$100 million budget. These Government sponsored space activities accommodate imagery, communication, weather forecasting and also military applications. Now the budget has been increased; with the increasing demands of natural resources, government and commercial enterprises have zeroed in on outer space.<sup>6</sup>

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<sup>2</sup>NASA Science, Solar System Overview <<https://solarsystem.nasa.gov/planets/earth/overview/#:~:text=While%20Earth%20is%20only%20the,made%20of%20rock%20and%20metal>> Last visited 20-06-2020.

<sup>3</sup> Stephan Lutter & Stefan Giljum, (SERI; Vienna/Austria), Natural Resources, what are they? Global resource use – Worldwide patterns of resource extraction (World Resource Forum) <<https://www.wrforum.org/publications-2/publications/>> Last visited 12-06-2020.

<sup>4</sup> Jean-Pierre Lehmann and Valérie Engammare, ‘Beyond Economic Integration: European Lessons for Asia Pacific?’ (The Globalist, Feb 3, 2014) <<https://www.theglobalist.com/beyond-economic-integration-european-lessons-asia-pacific/>> accessed 12<sup>th</sup> June, 2020.

<sup>5</sup>Bryce Space and Technology, (2017 State of the Satellite Industry Report,” Satellite Industry Association), <<https://brycetechnology.com/reports.html>> last visited 20-06-2020.

<sup>6</sup> Scot W Anderson, Corey Christensen & Julia LaManna, (The development of natural resources in outer space, Journal of Energy & Natural Resources Law, 37:2, 227-258, 2019), <DOI: 10.1080/02646811.2018.150

“In a scenario where space technology is literally galloping, business possibilities are exploding, space manufacturing is showing signs of viability, the reach of space law is becoming so expansive and applications so varied that the existing corpus of space law is far too inadequate for its object and purpose.”<sup>7</sup>Space has emerged as a propitious and progressively attractive prospect for an ambitious miner. The new scenario, mining of outer space bodies, with a wide vista of exploration, commercial viabilities and exploitative uses needs an amplified, pervasive and binding legal regimen.

### **MINERALS IN SPACE**

They did contemplate on the economic viability of space resources; The International Academy of Astronautics pronounced space resources as a blessing for humanity and also tacks on the economic development, especially for developing countries.<sup>8</sup> Dr. George C Nield, Assistant Administrator at Commercial Space Transportation said that “Once we are able to extract water and various minerals from the moon and other heavenly bodies, it will have a tremendous synergistic impact on our ability to explore the solar system and establish a true space economy.”<sup>9</sup>

“I frequently get the question: ‘what are you doing with Planetary Resources?’ The person asking generally assumes we’re getting into the business of harvesting the natural resources of celestial bodies. Instead, as you now know, we are working to harness the human resources of this celestial body—all the talent, wisdom, and creativity on the side-lines—and convert this potential energy into progress in space, and here on Earth.”

-Joseph Lubin, October 21, 2019

Mining institutions like Planetary Resources have found a high concentration of metallic resources on Asteroids. Some claim that asteroids contain a large amount of minerals; such amount has not been mined in human history.

## **II. ASTEROID MINING**

Voluminous minerals have been discovered on asteroids. Many expeditions have been organised and funded by states in the race to acquire the minerals in attendance in space. One such example of research mission is the Japanese Hayabusa. This Unmanned Spacecraft

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7343> last visited 20-06-2020.

<sup>7</sup> Fifty Years of Outer Space Treaty *Tracing the Journey*, Institute of Defence Studies & Analysis New Delhi, p. 25.

<sup>8</sup>New IAA Study on Space Mineral Resources, (International Academy of Astronautics, July 17<sup>th</sup>, 2015), <<http://www.spaceref.com/news/viewpr.html?pid=46378>> last visited 12-06-2020.

<sup>9</sup>New IAA Study on Space Mineral Resources, (International Academy of Astronautics Posted: Friday, July 17, 2015), <<http://www.spaceref.com/news/viewpr.html?pid=46378>> last visited 20-06-2020.

“Hayabusa” Landed on Itokawa (near earth asteroid) and found minerals like olivine and pyroxene. These kinds of asteroids have also bombarded earth before. Asteroids are minor planets, made from rocky airless remains left over from the proleptical establishment of our solar system about 4.6 billion years ago. They have been graded as C-type, S-type and M-type based on their composition.<sup>10</sup>

C-Type: “They are dark and rich in carbon.<sup>11</sup> They are far away from the sun; this increases the chances of them having water. Their high carbon content and water can prove to be highly advantageous for human consumption in future<sup>12</sup>, and can also work as rocket fuel when broken down into liquid hydrogen and oxygen.<sup>13</sup> It is very expensive to take water from earth to space, this can also prove to be beneficial for long run missions of space explorations.<sup>14</sup> They also contain levels of phosphorous that, when combined with the carbon, could be used as fertilizer to create more sustainable methods of food production in space.<sup>15</sup> For some scientist this idea is whimsical, they believe it to be difficult and highly expensive.<sup>16</sup>”

S-type: “These asteroids are stonier in composition.<sup>17</sup> Not only do they have significant amounts of iron, nickel, and cobalt, they also contain smaller amounts of gold, platinum, and rhodium.<sup>18</sup> Efficient extraction from S-type asteroids could prove most fruitful by bringing platinum and gold back to Earth and selling them in traditional metal markets.<sup>19</sup> The other metals would prove most useful if extracted and kept to be used in space.<sup>20</sup>”

M-type: “These are the asteroids of substance. They contain precious metals in large quantity and may prove to be game changer in the world economy.<sup>21</sup> These are also rarely available. Some have suggested that bringing platinum back to Earth would lower its price, thus

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<sup>10</sup> Asteroids: In Depth, <https://solarsystem.nasa.gov/asteroids-comets-and-meteors/asteroids/in-depth/> last visited 20-06-2020.

<sup>11</sup> William Steigerwald, New NASA Mission to Help Us Learn How to Mine Asteroids, NASA (Aug. 8, 2013), <<https://www.nasa.gov/content/goddard/new-nasa-mission-to-help-us-learn-how-to-mine-asteroids>>.

<sup>12</sup> *ibid.*

<sup>13</sup> *ibid.*

<sup>14</sup> Plans for Asteroid Mining Emerge, BBC (Apr. 24, 2012), <[<sup>15</sup> Steigerwald, \(n 6\).](https://www.bbc.com/news/science-environment-17827347#:~:text=Details%20have%20been%20emerging%20of,gold%20out%20of%20the%20rocks.>Last visited 12=06-2020</a></p></div><div data-bbox=)

<sup>16</sup> Plans for Asteroid Mining Emerge *supra* note 10.

<sup>17</sup> *ibid.*

<sup>18</sup> *ibid.*

<sup>19</sup> Philip Metzger, The Type of Asteroid to Mine, Part 3, PHILIP METZGER BLOG: SPACE MINING

<sup>20</sup> *Id.*; see also Andrea Nowicki et al., Near-Earth Asteroid Mining: What and How, EVERGREEN ST. C., <http://academic.evergreen.edu/curricular/astro/astro98/aprofolder/Asteroid/mining.htm> (last visited Oct. 24, 2016).

<sup>21</sup> Steigerwald, (n 6).

spurring innovation in energy-sector technology that relies on platinum.<sup>22</sup>,

### III. MISSIONS TO MINE SPACE RESOURCES

As demand for rare-earth minerals increases on earth, governments and private companies have set their sights on space and other locations as a source of minerals and materials. Planetary Resources, a privately owned space agency which aims at mining asteroids, has estimated around sixteen thousand near-earth asteroids which can be mined. The collection of samples from space for research started way back during Apollo missions in 1969. Still and all the foremost objective of the 'eleventh' Apollo mission was 'to complete the national goal' set by then President of United States of America, John F Kennedy, 'to perform a crewed lunar landing and return to Earth'.<sup>23</sup> Also, during the exploration, the crew had to gather the samples of lunar surface. Altogether, the six Apollo mission brought back 382kg of Lunar rocks, core samples, sand and dust from the lunar surface.<sup>24</sup> The six space missions collected around 'twenty-two hundred' discrete samplings from six different and distant exploration sites on the Moon.<sup>25</sup> After a successful mission from Apollo by USA, USSR also sent spacecraft and collected 300kg of lunar samples through Luna 16, 20, 24.

Samples were also collected from asteroids. In 2005, 'the Japan Aerospace Exploration Agency' (JAXA) sent an 'unmanned craft' to an asteroid named 'Itokawa' to collect surface samples.<sup>26</sup> The craft returned with over one thousand dust grains from the asteroid. The 'Hayabusa mission' made a number of discoveries that would determine the plausibility of asteroid mining in outer space.<sup>27</sup> Planetary Resources, the asteroid mining company, received a generous investment by Luxembourg and banking institution 'Société Nationale de Crédit et d'Investissement' (SNCI) worth 12 million Euros and along with grants of 13 million Euros to launch its 1<sup>st</sup> commercial asteroid mining expedition by this year.<sup>28</sup> The lack of partners in this mission got this mission cancelled.

Many such organisations like space or i-Space and Moon Express are still working on space mining projects. The major challenge before these privately-owned space agencies is brought

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<sup>22</sup> Market for Metals, (PLANETARY RES), <http://www.planetaryresources.com/asteroids/market-for-metals/> (last visited 12-06-2020).

<sup>23</sup> The History of Space Mining, <https://www.mining-technology.com/features/history-of-space-mining/> Last visited 12-06-2020.

<sup>24</sup> Lunar Rocks and Soils from Apollo Missions <<https://curator.jsc.nasa.gov/lunar/>> last visited 20-06-2020.

<sup>25</sup> *ibid.*

<sup>26</sup> The History of Space Mining, (n 19).

<sup>27</sup> *ibid.*

<sup>28</sup> Planetary Resources and The Government Of Luxembourg Announce €25 Million Investment And Cooperation Agreement, <https://www.planetaryresources.com/2016/11/planetary-resources-and-the-government-of-luxembourg-announce-e25-million-investment-and-cooperation-agreement/> last visited 20-06-2020.

by existing space treaties like the ‘Outer Space Treaty’ and ‘The Moon Agreement’.

#### IV. SPACE RESOURCE RIGHTS

The question of peaceful use of outer space as it is “a field in which many can contribute and all can benefit”<sup>29</sup>, was considered for the first time in 1958 and was wrapped in its resolution 1348(XIII). Subsequently, after deliberation, to govern outer space, and to maintain decorum in outer space for prosperity and security of humankind, the ‘Committee on the Peaceful Uses of Outer Space’ (COPUOS) was set up by the General Assembly in 1959. The foremost task of the committee was to review ‘international cooperation in peaceful uses of outer space’ by pondering over the space-related activities and the legal problems arising out of the exploration of outer space by nations.<sup>30</sup>

“The formation of this committee helped in the formulation of five treaties<sup>31</sup> that govern the space related legal issues. Which are:

- i. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (**Outer Space Treaty**).<sup>32</sup>
- ii. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (**Rescue Agreement**).<sup>33</sup>
- iii. Convention on International Liability for Damage Caused by Space Objects (**Liability Convention**).<sup>34</sup>
- iv. Convention on Registration of Objects Launched into Outer Space (**Registration Convention**).<sup>35</sup>
- v. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (**Moon Agreement**).<sup>36</sup>

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<sup>29</sup>Address by Francis T. P. Plimpton, U.S. representative on the U.N. Committee on the Peaceful Uses of Outer Space, at committee session. March 19, 1962.

<sup>30</sup>THE 1963 DECLARATION OF LEGAL PRINCIPLES, <<https://www.spacelegalissues.com/space-law-declaration-of-legal-principles-governing-the-activities-of-states-in-the-exploration-and-use-of-outer-space>> last visited 20-06-2020.

<sup>31</sup>Space Law Treaties and Principles, <<https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties.html>> Last visited 20-06-2020.

<sup>32</sup>General Assembly, resolution 2222 (XXI), opened for signature on 27 January 1967, entered into force on 10 October 1967.

<sup>33</sup>Adopted by the General Assembly in its resolution 2345 (XXII), opened for signature on 22 April 1968, entered into force on 3 December 1968.

<sup>34</sup>Adopted by the General Assembly in its resolution 2777 (XXVI), opened for signature on 29 March 1972, entered into force on 1 September 1972.

<sup>35</sup>Adopted by the General Assembly in its resolution 3235 (XXIX), opened for signature on 14 January 1975, entered into force on 15 September 1976

<sup>36</sup>Adopted by the General Assembly in its resolution 34/68, opened for signature on 18 December 1979, entered into force on 11 July 1984.

## V. OUTER SPACE TREATY

‘The Treaty on the Principles governing the Activities of States in the Exploration and Use of Outer Space’, includes moon and all the other celestial bodies, this treaty is referred to as ‘the Outer Space Treaty’.

Ratified by the ‘General Assembly’ in its resolution 2222 (XXI), opened for signature on 27 January 1967, entered into force on 10 October 1967<sup>37</sup>, constitutes the cornerstone of the governance and the legal framework for the peaceful use of outer space by nations. This treaty aims to give benefit of space explorations to all the nations.

The Treaty permits “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”<sup>38</sup> and “all states can use it 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.”<sup>39</sup>

Article I of the Outer Space Treaty, grants free access to space for the expeditions and utilization of outer space by all nations with discriminating on the basis of their scientific or economic development. This provision is the most important and indispensable to makes this treaty up to snuff. Although, the provisions are not absolute, are stipulated and defined within certain qualifications.<sup>40</sup>

The general ‘legal basis’ of peaceful management and utilization of outer space, permits use and exploration, without discrimination with any state. Also, all the investigations and research expeditions organised in outer space must be in accordance with the provisions of the space law. Outer Space Treaty doesn’t categorically deal with the commercial utilization and mining of resources available in outer space, though it includes some provisions which ensure that the conduct by state parties is in accordance with the space law.

“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.”<sup>41</sup>

First question raised is whether privately owned organisations, funded by the government

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<sup>37</sup>ibid.

<sup>38</sup>Outer Space Treaty, Art 1.

<sup>39</sup>ibid.

<sup>40</sup>DROIT SPATIAL, MIRELLE COUSTON, MISE AU POINT - ELLIPSES, 2014

<sup>41</sup>Outer Space Treaty, Art 2.



come under the non-appropriation principle

Article II gives freedom to all states to conduct research and exploration in outer space and also provides international assistance in such investigations<sup>42</sup> but prohibits the claim of sovereignty by any nation by occupation (or any other means) on the moon or any other celestial object.<sup>43</sup> This ambiguous language of Article II of the outer space treaty makes the private organisations to refuse admittance. Though, this claim of sovereignty by the privately owned organisations is vague.

“States Parties to ... whether such activities are carried on by governmental agencies or by non-governmental entities, the activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.”

Article IV of the Outer Space Treaty specifies that a non-governmental organisation of a privately owned organisation will need authorization by the state and will be under surveillance by the state signatory to the OST. State is the sovereign and everything within its ambit derives rights from their State, and when a State agrees not to do certain things, its organisation and citizens cannot foul up by their individual actions.

On the claims of such private organisations prohibiting the provision of national appropriation in the outer space treaty, The International Institute of Space Law shared its view “The distinction between ownership of celestial bodies and ownership of celestial resources is similar to the legal framework governing the high seas: while the high seas are outside the jurisdiction of any single nation, domestic laws protect property rights over resources (like fish) extracted from them.”<sup>44</sup>

**Second claim made by the organisation is that the OST talks about the sovereignty over the celestial bodies and not their resources. Their claim is on the resources....**

It is believed that activities like mining, extracting and trading of the resources brought from the space doesn't fall under the 'non-appropriation' principle of OST and people have right over the resources of the outer space.<sup>45</sup>

This means that State Parties and State sponsored private mining organisations have right to

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<sup>42</sup>ibid.

<sup>43</sup>ibid.

<sup>44</sup>MOON TREATY, The Countries That Signed The Moon Treaty, Jul 19, 2019 <[<sup>45</sup>The lawfulness of space mining activities by Louis de GouyonMatignon, under the supervision of Prof. Jean-Pierre Desideri.](https://www.statista.com/chart/18738/countries-that-are-signatories-or-parties-to-the-1979-moon-treaty/#:~:text=It%20is%20generally%20considered%20a,%2C%20Guatemala%2C%20India%20and%20Romania.> last visited 20-06-2020.</a></p></div><div data-bbox=)

explore the space and use the resources available in Space. Though legally, the OST nowhere prohibits or allows private (state owned) entities to mine space for resources or use the water and minerals present in outer space, but OST is clear about the ownership of the celestial body from which resources will be extracted and be traded on earth.

The more specific answer has been given under Moon Agreement of 1979.

“Neither the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person.”<sup>46</sup>

The Moon Agreement is very much alike to the Convention on the Law of the Sea, which is also a convention that deals with the mining of extra-terrestrial resources. The Moon Agreement or ‘Agreement Governing the Activities of State on the Moon and Other Celestial Bodies’ is not only for Moon. Article 1 elaborates that “The provisions of this agreement relating to moon shall also apply to other celestial bodies within Solar System, other than earth.”<sup>47</sup> This agreement authorizes peaceful use of Moon and other celestial bodies, to avoid any conflict and the use should be benefitable for the entire international community.

But this Agreement doesn’t close all the gates to mine other celestial bodies. This agreement also lays down some procedures to mine celestial bodies. Article 11 (5) of this agreement says that “States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible.”

Practically, to mine outer space, we need an agreement should be made the state parties before mining the outer space to commercial purpose. Since these activities are uncommon and way-out of the traditional practices of mining, which is inconceivable for some old hands. To overcome this uneasiness, to provide the means and put into effect the commercial mining of the outer space resources, we need a legal framework. All the state parties should get-together to put forward a new international legal regime for the exploration and commercial use of outer space resources for the benefit of humankind.

Though, this doesn’t restrict the current commercial space mining missions. Many jurists consider the Moon Agreement to be an unsuccessful treaty. It lacks ratification by States that are planning or have planned to launch space mining mission or other mission for utilisation

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<sup>46</sup>The Moon Agreement, Art 11(3).

<sup>47</sup>The Moon Agreement, Art 1.

of resources available in space. The Moon Agreement was signed by India, France, Guatemala and Romania<sup>48</sup> on 18 December 1979 and none of the signatory State has planned to launch mission for commercial utilization of minerals of outer space. Thus, the states which are interested in commercial utilization of space resource by mining space-based resources are not bound by the Moon Agreement and do not require any international agreement. Countries like Luxembourg and USA have made domestic laws governing the commercial utilisation of space-based resources.

## **VI. SPACE RESOURCE INSTITUTE ACT**

In 116<sup>th</sup> Congress session, a bill ‘Space Resource Institute Act’ was passed in the House of Representatives.<sup>49</sup> This Act aims at

“Identifying, developing, and distributing space resources, including by encouraging the development of foundational science and technology.”<sup>50</sup>

“Reducing the technological risks associated with identifying, developing, and distributing space resources.”<sup>51</sup>

“Developing options for using space resources to— (A) support current and future space architectures, programs, and missions; and (B) enable such architectures, programs, and missions that would not otherwise be possible”.<sup>52</sup>

This act acknowledges the new emerging sector of commercial use of the outer space resources and also takes a stock in from the partnership with educational research institutes, aerospace industry and also companies who aim to explore the outer space to extract minerals (extractive industry).

The word “Extractive Industry” has been used in this Act, which means “companies and individuals involved in the processes of extracting, including mining, quarrying, drilling, and dredging, raw, natural materials or energy sources.” Also, the word “Space Resource” used in this act includes “a raw, natural material or energy source.

## **VII. COMMERCIAL SPACE LAUNCH COMPETITIVENESS ACT**

United States of America became the first country to ratify national regulation/legislation on 25<sup>th</sup> November 2015 by enacting the Commercial Space Launch Competitiveness Act

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<sup>48</sup>Moon Treaty (n 40).

<sup>49</sup>Space Resources Institute Act, <<https://www.congress.gov/bill/116th-congress/house-bill/1029>> last visited 20-06-2020.

<sup>50</sup>Space Resources Institute Act, Sect 2 (a) (1).

<sup>51</sup>Space Resources Institute Act, Sect 2 (a) (2).

<sup>52</sup>Space Resources Institute Act, Sect 2 (a) (3).

(CSLCA).<sup>53</sup> It consists of four Titles. This act covers various topics like promoting and spurring private aerospace competitiveness and entrepreneurship<sup>54</sup>, requirements for reports on commercial remote sensing operations<sup>55</sup>, detailing the administrative functions of the Office of Space Commerce<sup>56</sup>, and establishing property rights in outer space<sup>57</sup>. It defines asteroid resources as “a space resource found on or within a single asteroid,”<sup>58</sup> and space resources as “an abiotic resource in situ in outer space,” which includes water and minerals.<sup>59</sup>

The title IV is named ‘Space Resource Exploration and Utilization’, to be referred to as the ‘Space Resource Exploration and Utilization Act of 2015’. Section 402 of this Act acquiesces the utilization of space resources. “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”.<sup>60</sup>

Through this act, the congress has asked the President of the United States to comply with all obligations of the international space law, for this the President has to submit a report citing all the authorities crucial to adhere with international obligations.<sup>61</sup>

The Outer Space Treaty and the Moon Agreement prohibit sovereignty over the celestial bodies. This Act assures the international organisations that through this act United States does not assert sovereignty or sovereign or exclusive rights or jurisdiction over, or ownership of, any celestial body, thus, giving reassurance that every exploration under this act would comply with the Article II of the OST and this protects this act from possible international treaty violations.

The International Institute of Space Law (IISL) conducted a study and analysed the Commercial Space Launch Competitiveness Act. The evaluation was done on three key legal issues in 2 different treaties. The first being Article II of the ‘Outer Space Treaty’, which prohibits claim of ‘sovereignty by occupation’ or any other means. Second was Article I Para 2 of the Outer Space Treaty, which specifies the right of the free exploration and use of outer space and celestial bodies, without discrimination of any kind, on the basis of equality and in

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<sup>53</sup>HR 2262, available at <[www.congress.gov/bill/114th-congress/house-bill/2262/text](http://www.congress.gov/bill/114th-congress/house-bill/2262/text)>.

<sup>54</sup> CSLCA Act, Title I.

<sup>55</sup> CSLCA Act, Title II.

<sup>56</sup> CSLCA Act, Title III.

<sup>57</sup> CSLCA Act, Title IV.

<sup>58</sup> CSLCA Title IV Chapter 513 § 15301(1).

<sup>59</sup> CSLCA Title IV Chapter 513 § 15301(2)

<sup>60</sup> CSLCA Act, Section 402

<sup>61</sup> *ibid.*

accordance within international law. And the last was the Moon Agreement's Article 11 (3).

The first and the most important have been clearly established in Article 402 of the Act. Yet in the second there is no mention that 'free use' means utilizing space resources by any State. Lastly, the USA is not a signatory of the Moon Agreement and hence is not bound by any International Law to not extract resources from the Space.

"The International Institute of Space Law (IISL) interpreted the Act as: 'in view of the absence of a clear prohibition of the taking of resources in the Outer Space Treaty one can conclude that the use of space resources is permitted. Viewed from this perspective, the new United States Act is a possible interpretation of the Outer Space Treaty. Whether and to what extent this interpretation is shared by other States remains to be seen.'"<sup>62</sup>

Various space exploration industry had greeted this Act. An organisation called Deep Space Industry welcomed it by calling it 'birth of a new legal regime'. The legal counsel on behalf of Deep Space Industry called it "the birth and passage of the first national space resource utilization legal regime is the first step toward further international cooperation in space and it will ultimately benefit all mankind. With similar legislation being drafted in other nations, bilateral and multilateral agreements will develop between like-minded nations that see the economic, environmental, and social importance that space resource utilization will bring to their respective countries."<sup>63</sup>

To meet the international obligation of space law, a letter was issued by the Office of Science and Technology (OSTP) "identifying all appropriate authorizations and supervision authorities and also to recommend an authorization and supervision approach that would prioritize safety, utilize existing authorities, minimize burdens to the industry, promote the US commercial space sector and meet the United States obligations under international treaties."<sup>64</sup>

The report u/s 402 wasn't issued<sup>65</sup>. Though, the report u/s 108 of the CSLCA Act endorses a 'light-touch' authorisation/supervision process in order to meet the commitments as contained under purview of Article VI of the Outer Space Treaty for the commercial

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<sup>62</sup>The IISL Position Paper of 20 December 2015.<<http://iislwebo.wwwnlss1.a2hosted.com/wp-content/uploads/2015/12/SpaceResourceMining.pdf>> last visited 20-06-2020.

<sup>63</sup>TANJA MASSON-ZWAAN AND NETA PALKOVITZ, Regulation of space resource rights (Meeting the needs of States and private parties, Jan 30, 2017 )<<http://www.qil-qdi.org/regulation-space-resource-rights-meeting-needs-states-private-parties/>> Last visited 20-06-2020.

<sup>64</sup> EXECUTIVE OFFICE OF THE PRESIDENT, OFFICE OF SCIENCE AND TECHNOLOGY POLICY <[https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/csla\\_report\\_4-4-16\\_final.pdf](https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/csla_report_4-4-16_final.pdf)> Last visited 20-06-2020.

<sup>65</sup>ibid.

utilization of the resources present in the outer space.<sup>66</sup> This report gives Department of Transport/Federal Aviation Administration (FAA) to authorise such ‘non-traditional’ and ‘unacquainted’ mission to extract resources for deep space. Other bodies like Department of Defence and Department of State have been given the responsibility to coordinate with FAA and review the payload.<sup>67</sup>In July 2016, the first license was issued by Department of Transport/Federal Aviation Administration to a commercial mission to moon.

### **VIII. LUXEMBOURG’S DOMESTIC LAWS FOR SPACE MINING**

Along with United States of America, Luxembourg is also a preeminent nation in the space mining mission. Barely after a year, in 2016, it made public a draft law governing the exploration and use of outer space resources by privately owned companies and gave them green light to launch exploration for the utilization of space resources. By doing so it became the first European country to implement legal regulatory framework recognising privately owned space exploration mission for commercial use.

According to Deputy Prime Minister and Minister of the Economy, Etienne Schneider:

“The legal framework we put in place is perfectly in line with the Outer Space Treaty. Our law does not suggest either establishing or implying in any way sovereignty over a territory or over a celestial body. Only the appropriation of space resources is addressed in the legal framework. Luxembourg’s new space legislation confirms the strong commitment to become a European hub for the exploration and use of space resources.”<sup>68</sup>]

Luxembourg has made it easier for the private entities to mine space; Article 1 of the draft declares appropriation of the outer space resources and provides that this will be in accordance with the international space law. It made it reasonable by giving example of earthly mining or fishing in the high seas. One can own the product but not the origin of that mined resource. Though, the law made by Luxembourg is not expansive, it excludes authorization, supervision and registration of the launches and the objects (payload) that are to be launched for the exploration of resources in outer space. This law is limited to authorization and supervision of the exploration and use of space resources.

Article 15 of the draft makes an alluring difference with United States law. It seems to be that the Luxembourg draft holds authorized operators fully liable for damage, i.e. there is no cap on liability, which may make obtaining insurance difficult<sup>69</sup>. The press release of 11

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<sup>66</sup>ibid.

<sup>67</sup>ibid.

<sup>68</sup>ibid.

<sup>69</sup> ibid.

November announced that ‘negotiations are underway to formalize relationships with around twenty companies and entrepreneurs originating both from Europe and from outside of Europe’.<sup>70</sup>

### LAWFULNESS OF SPACE MINING ACTIVITIES

The Outer Space treaty constitutes basis for activities of states in outer space and governs the behaviour of space explorations in outer space. It is a successful treaty and has completed about half a century of successful and peaceful cooperation in space.<sup>71</sup> Four subsequent treaties elaborate on the basic principles of the OST (the Rescue and Return Agreement of 1968, the Liability Convention of 1972, the Registration Convention of 1976, and the Moon Agreement of 1979)<sup>72</sup>

### State Liability

When Luxembourg signed an agreement with Planetary Resources, a US based privately owned space exploration organisation, to extract the resources available in deep space. This raised many questions on the state liability. If something goes out of order, who will be liable, US or Luxembourg?

Though, Article IV reaffirms that all the use and exploration of outer space by a non-governmental entity should be duly authorized by the State. It also obligates the State to supervise the aforesaid entity for its entire mission in outer space. States have the power to authorise any private entity on its soil, any foreign government/non-government entity in its soil or its private organisation on foreign soil. But this still doesn't answer who will be liable and how his liability will be determined. With the current emerging trend in commercialisation of space resources, COPUOS has made it a little easier for all countries by issuing guidelines to adopt national legislation to govern all commercial mining missions on space.

Article VII of the OST provides “that launching States are internationally liable for damage caused by their space object to another State or its persons or property. This is further elaborated in the 1972 Liability Convention. A launching State is defined in the Liability Convention as a State that: (1) launches a space object; (2) procures the launching of a space object or (3) launches a space object from its (a) territory or (b) facility”<sup>73</sup> “For damage on

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<sup>70</sup>ibid.

<sup>71</sup>UNITED NATIONS TREATIES AND PRINCIPLES ON OUTER SPACE (UNITED NATIONS New York, 2002) <<http://www.unoosa.org/pdf/publications/STSPACE11E.pdf>> Last visited 20-06-2020

<sup>72</sup>HANS KELSEN, PRINCIPLES OF INTERNATIONAL LAW (11 ed. 1952)

<sup>73</sup>ibid.

Earth or in the air, liability is absolute, meaning that no proof of fault is required. For damage in outer space, on the contrary, liability is based on fault.”<sup>74</sup>

The 1972 Liability Convention provides that “the term space object includes component parts of a space object as well as its launch vehicle and parts thereof” which is not a very precise definition<sup>75</sup>. Article XI of the OST provides that “States must have due regard for each other’s activities, must avoid both the harmful contamination of outer space and adverse changes to the environment of the Earth, and that their activities must not cause harmful interference with the activities of other States<sup>76</sup>. This article is often seen as the link to the issue of space debris mitigation and remediation, but it does not contain a clear legal obligation to not pollute space (mitigation) or to clean up debris (remediation)<sup>77</sup>.”

## **IX. CONCLUSION**

All the national legislation adopted by few countries who are looking forward to launch mining expeditions to the outer space, especially to asteroids, establish their property right over that celestial body. Although, this claim is in conflict with the current space treaties, but using the ambivalent language of these treaties, many have claimed their right on the resources available in outer space. While the OST makes it impossible for States to claim sovereignty and national appropriation, it is more ambiguous about its meaning of what approved uses of outer space include. It is a debatable issue, but the enactment of an international agreement to guide national legislations to govern these commercial explorations is of foremost importance. Opinions may differ while reading the general language of the OST but what may seem fancy might be our future economy and lead us to prosperous life.

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<sup>74</sup>TANJA MASSON-ZWAAN AND NETA PALKOVITZ, (n 62).

<sup>75</sup>ibid

<sup>76</sup>PAUL D. SPUDIS, THE VALUE OF THE MOON: HOW TO EXPLORE, LIVE, AND PROSPER IN SPACE USING THE MOON’S RESOURCES (2016).

<sup>77</sup>ibid.