

## MARS COLONIZATION PLAN: THE POSSIBILITY AND SCHEME FOR APPROPRIATION ON MARS

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### Abstract

*In the dawn of space era, State-driven and monopolized the space activities. This was exacerbated by high cost, military interference and the uncertain possibilities of civilian use. Nevertheless, as space technology grew, the enormous benefits created by space activities gradually motivated private companies to spend more capital and to use space for commercial purposes. Recently, two major of private space firms, SpaceX and Mars One reportedly has released their mission to Mars in order to conducted Mars Colonization Plan. On the other hand, the Outer Space Treaty and the rest of Corpus Juris Spatialis clearly prohibits to do appropriation on the Moon and the other Celestial Bodies, including Mars. It will be a new challenge for all legal actors, especially in the sense of the outer space regime, to explore this concept. This study applies normative legal research methodology. This study found: the current Outer Space Treaty particularly related to the non-appropriation principle is not relevant to the development of space technology and activities. Then, in this study the non-appropriation principle will be revisited based on the customary international law mechanism. Second, this study found the suitable scheme of appropriation during Mars Colonization Plan by establishing an Independent entity which authorize and organize the activities and also by implementing several stages in appropriating the Martian areas. Third, this study then proposed legal framework through amending and modernizing the Outer Space Treaty in order to compromise between the non-appropriation principle and the development of space commercialization.*

**Keywords:** *Corpus Juris Spatialis, Mars Colonization, Non-Appropriation.*

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## A. Introduction

Today, outer space can be said to be part of our daily lives. Through a focused approach, space has opened exclusively new doors for all forms of commercial, industrial and scientific enterprises, ranging through agriculture, astronomy, communications, environmental protection, fisheries, discovery and conservation of natural resources, medical and pharmaceutical science.<sup>2</sup> Therefore, to govern advance development of space-related problems, space law arises to control these developments.

Space law, like other branches of public international law and indeed international law itself, has its roots in the need to lay down a number of more or less simple rules regulating relations between members of an increasingly unified international community, in particular the Community of States.<sup>3</sup> Compared to other public international law branches, space law is *a sui generis* branch of public international law. The technical advances over the last hundred and forty years have forced the law to respond.<sup>4</sup> More precisely, “*law never seeks to control technology, but instead seeks to position order in the light of conflicting human interests arising from that technology*”.<sup>5</sup>

In a short period, space law has been used with respect to the collection of international and national rules and regulations regulating human activities in and off the area of outer space.<sup>6</sup> The purpose of space law is to create a legal framework that enables the achievement of common goals and interests related to the exploration and use of outer space, while at the same time preventing the emergence of tensions and conflicts between subjects in outer space activities.<sup>7</sup> Space law applies not only to activities taking place in outer space, such as remote sensing and weather forecasting carried out by satellite, but it also applies terrestrially, such as responsibility for damage caused by a space object or part of it falling to the ground.<sup>8</sup> However, it may seem odd that international space law does not include a clear definition or limitations of “outer space” until today. The exact meaning of where outer space starts is not protected and governed by all instruments of international

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<sup>2</sup> Bin Cheng, *Studies in International Space Law*, (Clarendon Press, 1997) 27.

<sup>3</sup> Frans von Der Dunk & Fabio Tronchetti, *Handbook of Space Law*, (Edward Elgar 2015) 1.

<sup>4</sup> Francis Lyall & Paul B. Larsen, *Space Law A Treatise*, (Ashgate 2009) 2.

<sup>5</sup> M. Bourbonniere, ‘National Security Law in Outer Space: The Interface of Exploration and Security’ (2005) 70 *Journal of Air Law and Commerce* 3-62.

<sup>6</sup> I.H.Ph. Diederiks-Verschoor, & V., Kopal, *An Introduction to Space Law*, (Kluwer Law International 2008) 6.

<sup>7</sup> V. Kopal, “Outer Space: A Legal Issue”, in C. Brunner and A. Soucek (eds), *Outer Space in Society, politics and law* (Springer Wien 2011).

<sup>8</sup> Fabio Tronchetti, *Fundamentals of Space Law and Policy*, (Springer 2013) vii.

space law. Nonetheless, several scientists and diplomats proposed that<sup>9</sup> the lower limit of outer space should be at an altitude of 100 km above sea level.<sup>10</sup>

As the “son” of cold war between the United States and the Soviet Union<sup>11</sup>, space law is a very modern field of regulation, but, although it’s obvious birthdate might be thought to be the launch of Sputnik I on 15 October 1957, its origins lie much further back. Once Sputnik and its successors had shown access to space to be practicable, serious discussions were initiated regarding the legal status of outer space in the international community, particularly at the United Nations (UN). The successfulness of Sputnik I in orbiting the Earth followed by a series of further space missions, such as the launch of first manned spaceflight, Yuri Gagarin, in 1961, and one of the historical moments for human being to set foot on the Moon, by Neil Armstrong in 1969. In order to overcome the legal vacuum on this sphere, therefore in 1958, the United Nations established an Ad Hoc Committee on the Peaceful Uses of Outer Space (UNCOPUOS)<sup>12</sup> and subsequently in 1961, it became permanent committee on the United Nations General Assembly (UNGA).<sup>13</sup>

The Committee has had responsibility to coordinate the activities of national government in space. Beside of that, the Committee also bear responsibility to develop the principles that applied in the outer space. Since its establishment, the Committee had promulgated several regulations dealing with space activities such as Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies 1967,<sup>14</sup> Agreement on the Rescue of Astronauts, the

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<sup>9</sup>Federation Aéronatique Internationale (FAI) has also accepted the 100 km demarcation. The FAI publishes guidelines and tracks space operations. Nevertheless, the FAI is an NGO and so its opinions on the States are not binding. The Australian Space Law Act also makes allowance for the demarcation of air space and open space at an altitude of 100 kilometers from the sea level.

<sup>10</sup>The 100 km margin is based on the Karman line principle. According to this theory, also called the 'aerodynamic lift theory,' everything over 100 kilometers is considered to be 'outer space,' since any aircraft would have to fly faster from this altitude than the orbital speed to obtain a sufficient aerodynamic lift to support itself.

<sup>11</sup>D. S. N. Heriyanto, Yaries Mahardika Putro, and Haekal Al Asyari, Space Diplomacy as A Way to Face the Era of Space Commercialization in Indonesia, (Proceedings of the 3<sup>rd</sup> National Seminar of Aerospace and Outer Space, Surabaya, 6-8 August 2018).

<sup>12</sup> General Assembly Resolution 1472, *International Cooperation in the Peaceful Uses of Outer Space*, A/RES/1472(XIV) (12 December 1959), available from [https://undocs.org/en/A/RES/1472\(XIV\)](https://undocs.org/en/A/RES/1472(XIV))(hereinafter UN GA Res.1472).

<sup>13</sup> UNGA Res. 1721 (XVI) B, of 20 December 1961; General Assembly – Sixteenth Session Resolutions adopted on reports of the First Committee, at 6. (hereinafter UN GA Res.1721).

<sup>14</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, London/Moscow/Washington, (1967), 610 UNTS. (hereinafter Outer Space Treaty).

Return of Astronauts and the Return of Objects Launched into Outer Space 1969,<sup>15</sup> the Convention on International Liability for Damage Caused by Space Objects 1972,<sup>16</sup> Convention on Registration of Objects Launched into Outer Space 1975,<sup>17</sup> Agreement Governing the Activities of States on the Moon and Other Celestial Bodies 1979<sup>18</sup> or known as *corpus juris spatialis internationalis*,<sup>19</sup> as well as the declarations and resolutions.

Specifically, the development of the law is always incorporated within the scope of the law itself. In this regard, the development of space law is influenced by the development of its activities. Initiated by the Outer Space Treaty as the *Magna Charta* of the Space Constitution, then the Moon Agreement was developed as an additional agreement to regulate the exploration of the Moon and other celestial bodies. Scholars argue that the development of space activities was divided into three phases. This began with the “scientific research phase” which concerned the domination of the two space-faring nations bloc, the Soviet Union and the United States. This phase saw the establishment of new capabilities and new systems with the aim of demonstrating scientific and technological superiority and, through it, the supremacy of their respective political and economic systems. This phase began in 1957, when the Soviet Union succeeded in launching Sputnik-1 into orbit and ended in 1970, three years after the “Constitution” of Space Activities had been effective.

Subsequently, the second phase of space activities continued from 1970 to 1980. This phase, known as the “Operational phase” in which, the first international organizations were set up with the aim of managing specific satellite applications and responding to commercial considerations. The “Exploiting phase” was the latest phase of space activities. At this stage, there was a radical shift in the objectives from the previous two phases. At this stage, the aim of space activities was focused on economic profits.

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<sup>15</sup> Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of objects Launched into Outer Space, (1968), 69 UNTS 119, SopS 45-46/1970 (hereinafter Rescue Agreement).

<sup>16</sup> Convention on International Liability for Damage Caused by Space Objects, London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UNTS 2389; UKTS 1974 No. 16 Cmnd. 5068; ATS 1975 No.5; 10 ILM 1965 (1971). (hereinafter Liability Convention).

<sup>17</sup> Convention on the Registration of Objects Launched into Outer Space, New York, done 14 January 1975, entered into force 15 September 1976; 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; TS 1986 No. 5; 14 ILM 43 (1975). (hereinafter Registration Convention).

<sup>18</sup> Agreement Governing the Activities of States on the Moon and Other Celestial Bodies New York, done 18 December 1979, entered into force 11 July 1984; 1363 UNTS 3; ATS 1986 No.14; 18 ILM 1434 (1979). (hereinafter Moon Agreement).

<sup>19</sup> S.Hobe, “The Relevance of Current International Space Treaties in the 21<sup>st</sup> Century” (2002) 27Annals of Air and Space Law 335-346.

Indeed, states no longer played a role as the sole stakeholders in space activities. Rather, non-governmental organizations such as private companies, international organizations, non-governmental organizations and other individuals emerged as the newest subjects in this field. This "exploitation phase" began in the 1980s until today and will continue in the years to come.<sup>20</sup> In other words, this phase known as the space commercialization age.

In general, space commercialization involves the sale of resources, such as satellite communications, remote sensing, the launch of space objects, or even space tourism to ordinary citizens. State, foreign organizations and even private companies carry out these activities. With space activities evolving rapidly, space commercialization, both by states and private companies, has increased by leaps and bounds.<sup>21</sup> In the dawn of space era, state-driven and monopolized space activities. This was exacerbated by high cost,<sup>22</sup> military interference and the uncertain possibilities of civilian use. Nevertheless, as space technology grew, the enormous benefits created by space activities gradually motivated private companies to spend more capital and to use space for purposes such as remote sensing communications, satellite launches and space tourism. It has now become apparent that private commercial operations in space will be more expanded and will play an even more significant role in space undertakings.

Private space firms are primarily operating from the United States, Europe, the People's Republic of China and Russia. Activity continues to expand globally with a number of other countries having established launch capabilities, seeking to create new commercial launch sites or creating new launch capabilities.<sup>23</sup> The vision of space exploration included not only satellite communications, remote sensing, weather forecasting and other general space operations, but also the lunar and *Martian* landing plans. Several private companies, such as Space X and Mars One, have released their mission to the Mars Colonization Programs. Beyond ambitious targets for space exploration, Mars colonization has become a well-known phenomenon today, fueled by a potentially naive and somewhat unfounded suppositions that the Red Planet could be

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<sup>20</sup>Francesco Gaspari & Alessandra Oliva, *The Consolidation of the Five UN Space Treaties into One Comprehensive and Modernized Law of Outer Space Convention: Towards a Global Space Organization*, (Proceedings of The Space Treaties at Crossroads: Considerations for de lege ferenda, Athens, 28-29 August 2015).

<sup>21</sup> He. Qizhi, "Certain Legal Aspects of Commercialization of Space Activities" (1990) 15 *Annals of Air and Space Law* 333-342.

<sup>22</sup> Todd Harrison, et al., *Implications of Ultra-Low-Cost Access to Space*, (Rowman & Littlefield 2017) 1

<sup>23</sup>Peter D. Neshos, "Commercial Space Transportation: A New Industry Emerges" (1991) 16 *Annals of Air and Space Law* 393-423.

terraformed to support human existence at some point in time.<sup>24</sup> Regarding the Moon, in which low, barren and devoid of atmosphere is near to the earth. Life at the base of the Moon does not vary from that of the barren desert, with no hope of ever finding water.<sup>25</sup>

Two factors especially escalate these serious concerns. First of all, Mars is much more capable of sustaining human life than any other planetary body in the Solar System. About half the size of the Earth and with roughly the same amount of dry ground, Mars' gravity and temperature are within the range of human tolerance. It is also established that Mars has large deposits of frozen carbon dioxide from which essential oxygen, deuterium and helium-3 fuels can be extracted.<sup>26</sup> Liquid water, which could be used for both oxygen and irrigation in agriculture, is now believed to exist not far below the surface of the earth.<sup>27</sup>

The existence of water also increases the possibility for isolated organic life to occur on Mars. These life forms may have genetic material that could be used to treat diseases.<sup>28</sup> Mars' climate, temperature, and air pressure may be designed to support human life through a complicated process called terraforming, rendering the world a possible sanctuary for humans when the Earth become uninhabitable.<sup>29</sup> Mars is the only other planet in the Solar System to have a 24-hour day other than Earth, which may require greenhouses to be used to generate the gasses required for human life. There could be also several valuable ores on Mars that could be used to promote habitation.<sup>30</sup> Second, land claims on Mars would become more important primarily because of their separation from Earth. It is much more likely that Mars will eventually host a permanent, autonomous colony than, for example, the Moon. A much longer travel time frame, however, requires a dedication to secure, autonomous structures and infrastructure. Claims on land, such as mining, agricultural and settlement rights, may last for the entire life of colonizers or beyond.

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<sup>24</sup>B. M. Jakosky & C.S. Edwards, "Inventory of CO<sub>2</sub> Available for Terraforming Mars" (2018) 2 *Nature Astronomy* 634.

<sup>25</sup>Igor Levchenko, et.al., "Mars Colonization: Beyond Getting There" (2019) 3 *Global Challenges* 1.

<sup>26</sup>David Collins, "Efficient Allocation of Real Property Rights on the Planet Mars" (2008) 14 *Boston University Journal of Science and Technology Law* 203.

<sup>27</sup>Arden L. Albee, "The Unearthly Landscape of Mars", (2003) 288 *Scientific American* 49-52.

<sup>28</sup>Laurence Bergreen, *Voyage to Mars: NASA's Search for Life Beyond Earth*, (Riverhead Books 2000) 208.

<sup>29</sup>Robert M. Zubrin & Christopher P. McKay, "Terraforming Mars", in Stanley Schmidt & Robert M. Zubrin (Ed), *Island in the Sky: Bold New Ideas for Colonizing Space* (Wiley 1996)125-126.

<sup>30</sup>Robert M. Zubrin & David A.Baker "Mars Direct: A Proposal for the Rapid Exploration and Colonization of the Red Planet", in Stanley Schmidt & Robert M. Zubrin (eds), *Island in the Sky: Bold New Ideas for Colonizing Space* (1996).

Intense efforts by the world's space agencies and more recently, private companies have taken us ever closer to providing large technological capabilities to transport a limited number of colonizers and equipment to Mars. These capabilities have been addressed in depth in a series of detailed analysis and opinion articles detailing the numerous opportunities and obstacles facing a Mars settlement plan.<sup>31</sup>

Scientifically speaking, the colonization of Mars does not pose a contentious problem for the international community. It's seen as the next giant leap in human history. On the contrary, it will be a new challenge from a legal standpoint, however, especially in the sense of the outer space regime, to explore this concept. The concept of non-appropriation is the most basic concepts that the space law system upholds and stresses. It mentioned under Article II of the Outer Space Treaty which generally explained that "*outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of uses or occupation, or by any other means.*" It then can be inferred that the Mars colonization idea which proposed by those three space actors is against the outer space treaty. Therefore, in this study, the author would like to revisit the notion of non-appropriation principle to the idea of Mars colonization plan and also proposed several ideas to the future space law models which considering the development of technology but in the other side do not denying the concept of legal certainty and justice.

## **B. Problem Formulation**

In shaping the research analysis, this study focuses on analyzing three problems: First, how to enforce and interpret the appropriation principle during the Mars Colonization Plan? Second, what is the suitable scheme of land acquisition on Mars?

## **C. Methodology**

The Normative legal research applied within in study. It is a process to find a legal rules, legal principles, and doctrines of the law to address the legal issues at hand.

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<sup>31</sup> Sydney Do, et.al., "An Independent Assessment of the Technical Feasibility of the Mars One Mission Plan – Updated Analysis" (2016) 120 Acta Astronautica 192-228.

## D. Discussion and Result

### 1. Revisiting Non-Appropriation in the Mars Colonization Plan

#### a. The Original Interpretation of the Non-Appropriation Principle

The root of Outer Space Treaties in the Cold War suggests a specific concept of non-appropriation.<sup>32</sup> In the 1960s countries were afraid if the two principal space farers of the period, the United States (US) and the USSR, gave legal rights to ample space or celestial bodies from which nuclear weapons could be launched.<sup>33</sup> There have also been opportunities to keep space free and open and to collect information via satellite.<sup>34</sup> Therefore, the Outer Space Treaty has been adopted and ratified, to a large extent, in order to avoid the misuse of any appropriation. This is an aim that would have been severely compromised had the signatories not understood at that time that the Treaty was widely applicable.

Private individuals and corporations are not included in the Treaty, perhaps unintentionally, but because the draftsmen have no reason to consider extending the scope of the Treaty to these parties.<sup>35</sup> The Treaty was drawn up on the basis that Member States are the only space actors.<sup>36</sup> Given the technological capabilities at the time, manned space flight required the full help of the whole country, it would have been virtually impossible for a private corporation to obtain the resources necessary to do something comparable alone.

The Treaty's *Travaux Préparatoires* confirms this understanding. Arthur Goldberg, the US Permanent Representative, summarized the main concerns of inclusion in the future Outer Space Treaty in a letter to the Chairman of the Committee on Peaceful Uses of Outer Space dated 16 June 1966. Paragraph 2 of his letter included that “*celestial bodies should not be subject to any claim of sovereignty.*”<sup>37</sup> Goldberg later incorporated this key point in the proposed Treaty provision, which reads when proposing a language proposal for the Treaty itself, “*Celestial bodies are free for exploration and use by all States.*”<sup>38</sup> In Goldberg's view, the very specific "claim of

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<sup>32</sup> Joanne Irene Gabrnowicz, “Space Law: Its Cold war Origins and Challenges in the Era of Globalization” (2004) 37Suffolk University Law Review 1043.

<sup>33</sup> *Ibid.*

<sup>34</sup> Thomas Gangale, *The Development of Outer Space: Sovereignty and Property Rights in International Space Law* (Praeger 2009).

<sup>35</sup> A/AC.105/INF.139 2 September 1966 (hereinafter Letter from Arthur J. Goldberg).

<sup>36</sup> Virgiliu Pop, “Appropriation in Outer Space: The Relationship Between Land and Ownership and Sovereignty on the Celestial Bodies” (2000) 16 Space Policy 276.

<sup>37</sup> Goldberg, *Op.Cit.*

<sup>38</sup> *Ibid.*

sovereignty" issue was resolved by referring to States in the Treaty language. Given that entities other than states could participate in the exploration and use of outside space, his proposed language would probably have been more detailed to adhere to the fundamental point he defined as central to the Treaties.

The implied prohibition of private appropriation is also stated in other elements in the background of negotiations under the Outer Space Treaty.<sup>39</sup> The reactions of each State to the non-appropriation principle are especially relevant. For example, on 4 August 1966, the Head of the Delegation of Belgium declared his country “*had taken note of the interpretation of the term ‘non-appropriation’ advanced by several delegations, apparently without contradiction, as covering both the establishment of sovereignty and the creation of titles to property in private law*”.<sup>40</sup> The French delegation voiced a similar opinion, mentioning that “*there was reason to be satisfied that the basic principle was affirmed, namely: the prohibition of any claim of sovereignty or property rights in space.*”<sup>41</sup>

C. Wilfred Jenks, who wrote two years before the Treaty was signed, noted that only by the United Nations acting on behalf of the world community would any portion of the space be appropriate.<sup>42</sup> States acting alone, and certainly persons, were not entitled to take any part in space. As late as 1979, there remained an implicit understanding that the no-appropriation principle applied to all celestial resources, at least for commercial purposes. Writing on the Moon Agreement that has supposedly applied many principles of the Outer Space Treaty to the Moon, von der Dunk noted the delegates' understanding that “*any substantial, especially commercial, exploitative activities required the consent of the community of States.*”<sup>43</sup>

Legal scholars have argued that the application of the Article II of the Outer Space Treaty was controversial. The main question is that Article II applies to States and private operators alike. Some scholars argued that the space appropriation is not forbidden. They argue that "all states" which means that private operators can exercise their property rights in or out of space, refers only to sovereign countries. For example, Gorove wrote in 1986: “*Thus, at present an individual acting on his own behalf or on*

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<sup>39</sup> Pop, *Loc.Cit.*

<sup>40</sup> *Ibid.*

<sup>41</sup> *Ibid.*

<sup>42</sup> Wilfred.C. Jenks, *Space Law* (Praeger 1965) 201.

<sup>43</sup> F.G. Von der Dunk, “The Moon Agreement and the Prospect of Commercial Exploitation of Lunar Resources”, (2007) 32 *Annals of Air & Space Law* 98.

*behalf of another individual or private association or an international organization could lawfully appropriate any parts of outer space".* Dasch, Smith, and Pierce share Gorove's view. They affirm that "Several Principles have been established by customary law and treaty. First national sovereignty stops where outer space begins. Second, that national appropriation of the Moon, other planets, asteroids, etc, is forbidden. And third, that private property rights are not forbidden".<sup>44</sup>

Subsequently, Fountain also strengthening that: "*The Outer Space Treaty only bans national appropriation of celestial bodies. It does not specifically mention resources removed from such bodies nor does it specifically mention or prohibit appropriation by private industry.*"<sup>45</sup> Nevertheless, this perspective was uncommon at that time. Even in the academic circles, the role of private entities or individuals in the outer space activities was not broadly discovered. Several contemporary legal experts indicated that the draftsman of the Outer Space Treaty really wants to rule out the possibility of non-appropriation by individuals and private companies.<sup>46</sup>

#### **b. The Development of Non-Appropriation Principle following the Outer Space Treaty based on Customary International Law**

After the Outer Space Treaty came into force, some countries agreed to reinterpret the non-appropriation concept as narrower than their authors originally expected. This reinterpretation was generally embraced by space-faring nations and was essentially unchallenged. This primarily influenced the principle of non-appropriation by altering customary international law. Withdrawing from its original general implementation in 1967, States allowing appropriation of extracted space resources. In this part, the authors would like to examine the shifting of non-appropriation based on the two elements of customary international law, State practice and *opinio juris*.

##### **i. State Practice**

Based on State practice, the first proposal for a change in customary international law to non-appropriation was made in 1969 when astronauts were first sent to the moon by the United States. As part of his historic trip, astronaut Neil Armstrong gathered lunar rocks he brought back to earth with him and quickly

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<sup>44</sup>Dasch, Smith, Pierce, "Conference on Space Property Rights: Next Steps" (2000) 8 Proceedings of the Forty-Second Colloquium on the Law of Outer Space 174.

<sup>45</sup> Fountain, "Creating Momentum in Space: Ending the Paralysis Produced by the Common Heritage of Mankind Doctrine" (2003) 35 Connecticut Law Review 1753.

<sup>46</sup> Alan Wasser & Douglas Jobes, "Space Settlements, Property Rights, and International Law: Could a Lunar Settlement Claim the Lunar Real Estate It Needs to Survive?" (2008) 73 Journal of Air Law & Commerce 37.

granted them to NASA as US property.<sup>47</sup> The Soviet Union subsequently claimed lunar material as government property, some of which was even sold to its citizens.<sup>48</sup>

The U.S. government currently stores 842 pounds of lunar materials.<sup>49</sup> There is no question that this material and other space resources acquired by US astronauts is the governmental property for both NASA and the U.S. government.<sup>50</sup> NASA expressly endorses U.S. property rights over these moon rocks, saying “*lunar material retrieved from the Moon during the Apollo Program is U.S. government property.*”<sup>51</sup>

## ii. *Opinio Juris*: Domestic Legislation

With regard to domestic law, the change in customary international law as it relates to the use of space resources has been further seen in the United States and abroad. U.S. space law is codified in the United States Code. Section 51 and has been periodically updated to extend the rights of private space actors.<sup>52</sup> Beginning in 1984, the Commercial Space Launch Act provided that “*the United States should encourage private sector launches and associated services.*”<sup>53</sup> The 1984 Act aimed to facilitate the launch of commercial spaces by private business and private individuals.<sup>54</sup> However, it did not explicitly mention commercial space mining. The Commercial Space Launch Amendments Act adopted the first such discussion of commercial use of space in 2004.<sup>55</sup> This Act was expressly intended to control space activities but did not include private space rights directly.<sup>56</sup>

The most important reform in U.S. space law came with the 2015 Spurring Private Aerospace Competitiveness and Entrepreneurship (SPACE) Act. As laid down in the U.S.C. Section 51, this Act provides:

*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*

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<sup>47</sup> Lunar & Planetary Institute of University of Space Research Association “*Apollo 11 Mission: Lunar Sample Overview*” <[https://www.lpi.usra.edu/lunar/missions/apollo/apollo\\_11/samples/](https://www.lpi.usra.edu/lunar/missions/apollo/apollo_11/samples/)> accessed 11<sup>th</sup> of November 2020.

<sup>48</sup> ThomasGangale& Dudley-Rowley, Marilyn, “To Build Bifrost: Developing Space Property Rights and Infrastructure” (2005) American Institute of Aeronautics & Astronautics, Working Paper.

<sup>49</sup> Matthew.J. Kleiman, *The Little Books of Space Law* (American Bar Association 2013) 157.

<sup>50</sup> *Ibid*, p. 156

<sup>51</sup> NASA Office of Inspector General, *NASA’s Management of Moon Rocks and Other Astromaterials Loaned for Research, Education, and Public Display* (NASA 2011).

<sup>52</sup> 3, 51 U.S.C. 10101-71302 (2018).

<sup>53</sup> Commercial Space Launch Act, Pub. L. No. 98-575, 2(7), 98 Stat. 3055 (1984).

<sup>54</sup> Tronchetti, 2013, *Loc.Cit.*

<sup>55</sup> Commercial Space Launch Amendments Act of 2004, Pub. L. No. 108-492, 118 Stat. 3974 (2004).

<sup>56</sup> Tronchetti, 2013, *Op.Cit.*, p. 30.

*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>57</sup>

Whilst the idea that private companies could have access to space would have seemed far-fetched to the drafters of the Outer Space Treaties, the SPACE Act 2015 was the first instance for a government recognizing this trend and recognizing the commercial rights of private companies to space supply by law. Now that the new Section 51 was amended in 2015 has been in place, US companies can be assured that any profits they generate from space mining at least under US jurisdiction are strictly legal. While the United States was the first country to reinterpret the non-appropriation principle, others are adopting it. Luxembourg passed the Discovery and Use of Space Tools law on 20 July 2017, with 55-2 votes.<sup>58</sup> Article 1 of the new law expressly specifies that 'space may be reserved' and that Article 3 clearly allows private companies to operate and space can be used for commercial purposes.<sup>59</sup> The Act entered into force on 1 August 2017. The Official commentary on this Act provides that its aim is to provide companies with legal certainty regarding the ownership of space resources, an aim that commentators regard as valid under the Outer Space Treaty despite the concept of non-appropriation.<sup>60</sup>

The UAE may be the next country to introduce similar laws. The UAE published specifics of the new UAE space law covering both human space exploration and economic activities, such as mining, in February 2020, says Mohammed Al Ahabbi, Director General of the UAE Space agency.<sup>61</sup> The UAE Space Act comprises 9 chapters and 54 articles which regulate and govern the role of the Agency throughout the country. The procedure for granting permits to space

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<sup>57</sup> Commercial Space Launch Competitiveness and Entrepreneurship Act (Spurring Private Aerospace Competitiveness and Entrepreneurship (SPACE) Act), Pub. L. No. 114-90, 51303, 129 Stat. 721 (2015) [hereinafter SPACE Act 2015].

<sup>58</sup> Jeff. Foust, *Luxembourg Adopts Space Resources Law*, (Space news 2017) <<http://spacenews.com/luxembourg-adopts-space-resources-law>> accessed on 11<sup>th</sup> of November 2020.

<sup>59</sup> Loi du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace [Law of 20 July 2017 on the Exploration and Utilization of Space Resources], Journal Officiel Du Grand-Duché De Luxembourg [J.O.] [Official Gazette of Luxembourg], Jul. 28, 2017, at A674-1.

<sup>60</sup> Legitech, *Space: The Final Frontier – Luxembourg Provides a Legal Framework for the Commercial Exploitation of Space Resources* <<https://www.legitech.lu/newsroom/actualites/space-the-final-frontier-luxembourg-provides-a-legal-framework-for-the-commercial-exploitation-of-space-resources>> accessed on 11<sup>th</sup> of November 2020.

<sup>61</sup> Spacewatch Global, *UAE Space Law Details Announced to Facilitate Space Sector Development* (Space watch 2020), <<https://spacewatch.global/2020/02/uae-space-law-details-announced-to-facilitate-space-sector-development/>> accessed on 11<sup>th</sup> of November 2020.

activities, space objects and vehicles recognition, space liability and insurance regulations, space accident and risk legislation, transitional lifespan for existing operator regulations, laws regulating the construction of facilities and the use of space resources on other planets.<sup>62</sup>

The New Legislation is intended to be more transparent, more versatile and more profitable. The aim is also to protect the interests of the UAE by balancing economic and commercial requirements, fostering creativity, safety, security and environmental requirements and promoting investment and private sector participation in the space industry.<sup>63</sup> Many major space powers, including Japan, China, and Australia, are also considering similar potential rules.<sup>64</sup> Senior officials in China's space program have expressly announced the country's aim is to explore outer space and use outer space resources.<sup>65</sup> In expecting a potential “space gold rush,” the general international trend clearly points in this direction.<sup>66</sup>

### iii. *Opinio Juris*: Legal Scholars

Although at the time of the Outer Space Treaty ratification, most legal scholars continued to follow the concept of non-appropriation originally, nowadays most legal scholars find the use of extracted materials is permissible.<sup>67</sup> Brandon Gruner points out that this new understanding is historically different from previous legal interpretations, noting that modern interpretations of the meaning of the Outer Space Treaty vary from those of the Treaty authors.<sup>68</sup>

Other scholars also argued that the use of the space resources collected is allowed by the Treaty, which means that the current SPACE Act is a realistic interpretation of the Outer Space Treaty.<sup>69</sup> Nevertheless, scholars remain cautious to determine the validity of the appropriation. For example, even though Thomas Gangale and Marilyn Dudley-Rowley pro's to the legality of extracted materials

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<sup>62</sup>*Ibid.*

<sup>63</sup>*Ibid.*

<sup>64</sup> Rishika Daryanani & Travis Fulton, *Asteroid Mining: Developments in Space Property Rights* (Natural Resources Blog 2017) <<https://www.accenture.com/us-en/blogs/blogs-asteroid-mining-developments-space-property-rights>> accessed on 11<sup>th</sup> of November 2020.

<sup>65</sup> Brandon C. Gruner, “A New Hope for International Space Law: Incorporating Nineteenth Century First Possession Principles into the 1967 Space Treaty for the Colonization of Outer Space in the Twenty-First Century” (2004) 35 *Seton Hall Law Review* 304.

<sup>66</sup> Spacewatch, *Loc.Cit.*

<sup>67</sup> Gangale & Dudley-Rowley, *Loc.Cit.*

<sup>68</sup> Gruner, *Op.Cit.*, p. 306.

<sup>69</sup> K.R. Sridhara Murthi, & V. Gopalakrishnan, Trends in Outer Space Activities: Legal and Policy Challenges, in Rao, R.V (eds). *Recent Developments in Space Law: Opportunities and Challenges* (Springer Singapore 2017) 34.

from outer space by private entities, nevertheless they argue that “ownership of and the right to use extraterrestrial resources is distinct from ownership of real property” and that kind of real property claim is against the law.<sup>70</sup> Lawrence Cooper is also careful to point out this distinction: “the Outer Space Treaties recognize sovereignty over property placed into space, property produced in space, and resources removed from their place in space, but ban sovereignty claims by states; international law extends this ban to individuals”.<sup>71</sup> On the other hand, Dr. Mardianis on his presentation explained that the claim of property on the Moon and other Celestial Bodies is the current challenge for the space lawyer. The existence of private space firms, such as For All Moonkind, make it clear that the intention to do claim an ownership of property on the Moon and Other Celestial Bodies is increasing.<sup>72</sup>

Taken together, the above-mentioned explanations, the statements made in the international community, the de facto appropriation of space resources in the form of moon rocks, the implementation of new national legislation authorizing the use of extracted space resources and the weight of international legal community opinion indicate a profound change in customary international law. Outer Space Treaties’ non-appropriation clause have been redefined from its original scope by customary international law norms to include a carve-out enabling the use of space resources after such resources were extracted.

## **2. The Suitable Scheme of Appropriation Process to the Mars Colonization Plan**

A new system is needed to pave the way for fair and effective uses of outer space. The new system should have two distinct components. First, an organization's creation to regulate activities with space resources. Second, a system for the appropriation of space and celestial bodies

### **a. International Space Authority (ISA)**

A new international organization with a mandate to create a "fair, efficient and stable legal environment for the commercial development of outer space" should be created in

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<sup>70</sup>Gangale & Dudley-Rowley, *Op.Cit*, p. 6.

<sup>71</sup>Lawrence.A. Cooper, “Encouraging Space Exploration Through a New Application of Space Property Rights” (2003) 19 Space Policy 117.

<sup>72</sup>Mardianis, “Paradigma Baru Kedaulatan dan Yurisdiksi dalam Bidang Penerbangan dan Antariksa”, (Small Group Discussion, Universitas Pertahanan, Bogor, 17 February 2020).

order to regulate private companies' activities for the pursuit of extraterrestrial profits.<sup>73</sup> ISAO membership must rely on participation and commitment to the use of space. It would be comprised of several stakeholders from different sectors, such as:

- a. States that have capability to invest in the outer space activities of have an NGO in space sector;
- b. States that have launching site facilities;
- c. Less developed nations; and
- d. The space industry.

The number of participants will increase as the number of countries ratifying the Treaty increases. This situation would not only allow developed countries to become part of the ISA but would also enable all nations to participate actively through the provision of facilities and investments for space contractors. The countries that supply them will be able to control the ISA by ensuring their membership through investment and practical support for commercial space-centered activities. The ISA will also have a regulatory body and will provide a way to start space commercialization.

The ISA serves a number of purposes. The key role is to regulate the activities of space operators under international law. The ISA maintains a registry of property rights and activities. It will also ensure that industrial practices will not result in overuse of resources and instead enhance the safety of the celestial bodies. Under the International Space Authority (ISA) system, any entity wishing to engage in space business would then be provided with the ISA license to register its application, which would include a provision that would be implemented to ensure compliance with the conditions set out in the ISA regulation. The breach of regulations will trigger the revocation of licenses and enforcing fine to the companies.

The ISA will also be responsible for securing property rights and revenue. There will be an ISA scheme involving the appropriation of space and celestial bodies. If the property in question has been seized and a license has been given that allows for commercial use, the operator will not only be aware of compliance with the license specifications but will be covered ensuring that his property claim is free.

The systems work well throughout the licensing process. It is necessary, however, not to make the licensing system too bureaucratic<sup>74</sup> by attempting to control all aspects of

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<sup>73</sup> Lynn M.Fountain, "Creating Momentum in Space: ending the Paralysis Produced by the 'Common Heritage of Mankind' Doctrine" (2003) 35 Connecticut Law Review 1764.

the organization's activities. The bureaucratic system would potentially obstruct space operators' activities. Subsequently, the ISA may also provide commercial chamber by providing a method of dispute settlement. The Deep Seabed Chamber of the International Tribunal for the Law of the Sea offers guidance for this scheme. The proposed Tribunal would provide a specialized forum for the resolution of space disputes.

The protection against monopolies will be another main function of the ISA. The new industrial companies would potentially increase the number of resources owned by the few, as they would be the first to have access to space. The ISA would be able to start investigations and thus avoid the monopolization of space resources.

#### **b. The Appropriation Scheme**

The appropriation procedure begins with the discovery, continued claims and ends in possession.<sup>75</sup> Discovery is just a theory to be used in so far as the Moon has already been discovered. The parties should have announced his intention to explore the land for a definite time. It will permit control over the space prospectors' activities, as the authority does not allow two different parties concurrently to explore the same region. It will reduce the possibility of disagreement resulting from conflicting claims.

Subsequently, the claiming extraterrestrial field would be the next step if the discovery were confirmed. This claim is registered with the ISA and is intended to remind the entire international community that the discovery of individual or organization recognized exclusive property rights. This registration of a claim would preclude further ISA licensing or registration for the subject-matter concerned. The claim would have been true for a given period of time and could not be extended.

The possession process is the final process for appropriating the *Martian* land. After effective possession, the area becomes the property of the requester. As regards *Martian* land, this would involve some sort of physical presence in the area. Throughout addition to physical activity, symbolic acts of possession can also take place.<sup>76</sup> This symbolic act was accepted as a required condition of customary international law.<sup>77</sup> Acts considered capable of addressing this requirement include taxes, protection of citizens and territorial

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<sup>74</sup>*Ibid*, p. 1776.

<sup>75</sup>Jonathan Thomas, "Privatization of space ventures: proposing a proven regulatory theory for future extraterrestrial appropriation" (2005) 1 Brigham Young University International Law & Management Review 219.

<sup>76</sup> Thomas, *Op. Cit*, p. 233.

<sup>77</sup>*Ibid*, p. 234.

protection.<sup>78</sup> The symbolic act of possession may seem new, but it is necessary to ensure that all extraterrestrial colonies have a set of rules agreed upon. With completion of its possession, the jurisdiction of the *martian* land would be the sole property of the parties concerned.

In order to implement those idea related to the scheme of appropriation in Mars. It shall be noted that, the amendment and modernization of the current outer space treaty is necessary. Meanwhile, related to the models of the new regulations in Mars exploration, this new regulation must uphold several points that has been governed previously by the *Corpus Juris Spatialis* regime such as, peaceful purposes, international cooperation, and the obligation to protect the celestial bodies' environment. The appropriation process will be comprehensively governed under this regulation, the rights and obligations of the stakeholders in utilizing the Mars resources also will be governed under these regulations, and also the sanctions form, and the dispute settlement body will be regulated by this new regulation. Subsequently, the regulations to the establishment of ISA and all operative regulations concerning the ISA will be comprehensively governed under this new regulation. Therefore, when all of commercialization activities conducted in Mars, the stakeholders' activities will not against the regulations and do not jeopardizing the Mars environment.

### **E. Conclusion**

The first 20 years of this century have witnessed rapid development in space exploration activities. NASA started by sending its rover to Mars, the purpose of this mission was to explore the surface of Mars while deepening an understanding upon the resources that available on Mars. It peaked in the middle of this decade, when Space X as the space private entity proclaiming to send the human being to Mars and start to establish the civilization, the *Martian*.

Indeed, if it analyzed by the *Corpus Juris Spatialis* particularly the Outer Space Treaty, the Space X plan to begin Mars colonization by 2030 would be irrelevant due to the prohibition to appropriate at the Moon and other Celestial bodies. Many of legal scholars have proposed their perspective upon the pros and cons of the appropriation of the Moon and other Celestial bodies. The original interpretation of non-appropriation based on the *Travaux Preparatoires* of the Outer Space Treaty did not consider other

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<sup>78</sup>*Island of Palmas Case* (US v. Netherlands) (1928) 2 R.I.A.A. 829.

actors such as private company from the act of prohibition the Moon and other Celestial bodies. These loopholes open many interpretations to the appropriation of the Moon and other Celestial bodies, especially the Mars.

Based on several basis and evidence, appropriation might be allowed in the future, but the claiming of complete sovereignty is still prohibited. The author considered that, the establishment of Federation or authority which bear responsibility upon the appropriation process is necessary. Therefore, the author proposes the concept of the International Space Authority (ISA) as the sole and independent body which responsible towards the activities of stakeholders in exploring and exploiting the Moon and other Celestial bodies. The author also suggest that process of appropriation shall conducted in three steps which are discovery, claim and possession. If it had possessed by one stakeholder, then it could not be possessed by others. The possession also has limitation time, in which in this case the author consider five years would be the appropriate time for stakeholders to gain many benefits from this appropriation action. Nevertheless, the equitable access and the peaceful of outer space must be maintain during this phase. Therefore, the international community will have to act quickly if it wants to maintain shared international control over space. The amendment of Outer Space Treaty and the formulation of a new legal regime concerning the Mars exploration shall be made. By this breakthrough, the economic incentives during the Mars exploration, giving equitable access of exploration, maintaining the peaceful of outer space and protecting the Mars environment would be run side by side and relevant to the international space law regime.

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