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**Commercial Mining Operations in Space and Legality of Them in  
the Context of International Law – ownership of the gathered  
resources**

Bachelor's thesis

Programme HAJB08/17 Law, specialisation: European Union and International Law

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Tallinn 2021

I hereby declare that I have compiled the thesis independently and all works, important standpoints and data by other authors have been properly referenced and the same paper has not been previously presented for grading.

The document length is 9763 words from the introduction to the end of conclusion.

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## **ABSTRACT**

The international laws regulating outer space provide contradictory framework regarding scope of the applicability of non-appropriation principle. It is not clear, does the principle extend to mined resources. National legislations have interpreted the principle to not take into consideration mined resources of celestial bodies.

Legality of mining operations in outer space is viewed in the light of non-appropriation- and common heritage of mankind principle. Outer space shares multiple same contents as Antarctica and the deep seabed. All contain abundance of rare resources. These entities are also viewed as province of mankind. The national appropriation is also prohibited. This thesis argues that by promoting core principles into customary law and interpreting outer space treaty in light of same principles of law of the seas and treaty of Antarctica, outer space mining would not be so controversial.

By slowing down the progress of national legislations, for limited time, international community could establish proper international governing entity that acts between international community and private entities. This study proposes that by regulating the industry, these resources, with proper controlling entity, could be made to benefit the whole humankind.

This review of international laws also brings to attention that by different approach to mining in outer space and international cooperation, multiple problems such as global warming and socio-economical problems could be solved.

Keywords: outer space mining, common heritage of mankind, non-appropriation

## INTRODUCTION

Space offers endless array of possibilities. We explore outer space in order to find habitable planets, new lifeforms and even intelligent species to interact with. We have already realized how much potential the outer space really offers, but have just in past decade had the tools and technological advancement to truly begin with space exploitation. Outer space objects such as meteors, moons, planets etc. contain abundance of minerals, which can be mined with proper technique and tools. However, international law is torn whether the mining operations are legal or not. What makes the situation even more difficult is the fact that only a few countries are advanced enough to even have the potential for operations in outer space. These countries, mainly USA, China, Russia and India have limited timeframe before other countries start to catch up and enter the field. These advanced countries can potentially start the mining operations in not so distant future. Without dependable and clear international legislation, and without the realistic possibility to enforce the international legislation, it is unclear are there mutually binding guidelines.<sup>1</sup>

Space law is a combination of domestic and international law.<sup>2</sup> International legal framework is based on five international treaties referred as the “five United Nations treaties on outer space”. These are “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 1967), “Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space” (Rescue Agreement 1968), “Convention on International Liability for Damage Caused by Space Objects” (Liability Convention 1972), “Convention on Registration of Objects Launched into Outer Space” (Registration Convention 1975, entered into force 15 September 1976) and “Agreement Governing the Activities of States on the Moon and Other Celestial Bodies” (Moon Agreement 1979, entered into force 11 July 1984).<sup>3</sup>

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<sup>1</sup> Harn, N. (2015). Commercial Mining of Celestial Bodies: Legal Roadmap. *Georgetown International Environmental Law Review*, 27(4), 629-644.p.632

<sup>2</sup> Gabrynowicz, J. (2004). Space Law: Its Cold War Origins and Challenges in the Era of Globalization. *Suffolk University Law Review*, 37(4), 1041-1066.

<sup>3</sup> United Nations Office for Outer Space Affairs (2017). International Space Law: United Nations Instruments. ST/SPACE/61/Rev.2. Retrieved from: [https://www.unoosa.org/oosa/oosadoc/data/documents/2017/stspace/stspace61rev.2\\_0.html](https://www.unoosa.org/oosa/oosadoc/data/documents/2017/stspace/stspace61rev.2_0.html) 12 November 2021

Currently there is increasing financial commitments to space activities. Most notably SpaceX programs focusing on missions on Mars, initiated by Elon Musk and Jeff Bezos's announcement to extract water from the Moon.<sup>4</sup> According to Article 2 of The Moon Agreement, all activities on the moon, which include exploration and use etc. shall be carried out in accordance with international law.<sup>5</sup> Furthermore, Article 4 outlines that the use of the Moon and the exploration shall be common heritage of humankind and all the activities shall be carried out for the benefit and in interest of all countries despite the level of scientific or economic development.<sup>6</sup> By this legal framework, private companies such as Musk's or Bezos's, wouldn't benefit directly from planned operations. It is contradictory, since the private companies do not only carry the risks integrated to technology and equipment, but also development and funding of the operation. However, USA is not contracting party in the Moon Agreement, and neither are other highly developed countries.<sup>7</sup> International law can seem more as hinderance, rather than barrier, since international law could be argued to lack in central enforcement and judicial regime.<sup>8</sup> What does it mean for development of new space legislation and guidelines, when countries appear to be reluctant to take part in international agreements? We have had similar confrontations between highly developed countries during the Cold War's race to space, the sovereign claims towards Antarctica and commercial mining operations of the deep seabed. There is a possibility now, to learn from past mistakes and change the narrative on how to operate in international matters.

First treaty regarding the outer space opened for signature on 27<sup>th</sup> of January 1967 and entered into force on 10<sup>th</sup> of October 1967 and the latest entered into force in 11<sup>th</sup> of July 1984.<sup>9</sup> Technology has grown exponentially in the last 50 years. Also, interest towards activities in space, in particular the moon, by governmental and private entities has surged in recent years. Current treaties regarding and governing activities in outer space appear to be outdated.<sup>10</sup> International

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<sup>4</sup> Koren, M. (2019). Jeff Bezos Has Plans to Extract the Moon's Water. [online] The Atlantic. Available at: <https://www.theatlantic.com/science/archive/2019/05/jeff-bezos-moon-nasa/589150/>

<sup>5</sup> The Moon Agreement (1984)

<sup>6</sup> *Ibid.*

<sup>7</sup> United Nations Treaty Collection, Status of Agreement governing the Activities of States on the Moon and Other Celestial Bodies, entry into force 11 July 1984. Retrieved from: [https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg\\_no=XXIV-2&chapter=24&clang=en](https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXIV-2&chapter=24&clang=en) 6 December 2021

<sup>8</sup> Goldsmith, J.L. and Posner, E.A. (1999). A Theory of Customary International Law. The University of Chicago Law Review, 66(4), p.1116

<sup>9</sup> *Supra nota 3*

<sup>10</sup> Harn (2015) *Supra nota 1*, p.632

law can sometimes be at best, slow to react with technological innovations and advancements. Domestic laws have been invented and researched in order to allow mining operations in space since international law does not have clear framework on how institutional entities and private companies should operate. The need for domestic legislation is rising because of continuous probing of outer space objects provides us with mineral deposits and possibilities for massive economical gains.<sup>11</sup> Operating in uncharted territory, especially in matters that deal with international situations and sovereignty, where possibility of armed conflict is constant and in order to protect own interests, legal framework has to be clear and definite. Outer space can soon very well be wild west of 20<sup>th</sup> century, if international legislation does not catch up with the technological leaps.<sup>12</sup>

International cooperation could arguably be suitable way forward.<sup>13</sup> The prospect of outer space mining is for the benefit of mankind. On Earth, we are experiencing climate warming, which is cause for industrial pollution, including mining. Mining operations on Earth destroy landscape, environment and natural habitat of many species. Furthermore, extraction process of rare resources on Earth requires acids and radioactive materials.<sup>14</sup> It also indirectly causes socio-economical problems and disparities such as child-labor and slavery in developing countries.<sup>15</sup> If mining operations could be conducted in outer space, these aforementioned problems could arguably be solved.<sup>16</sup> However, if such operations would be commenced despite legal uncertainty, sanctioning and possible benefit sharding would be impossible to enforce by international community.<sup>17</sup>

This thesis will research international treaties, domestic laws and legal literature regarding outer space and analyzes through qualitative methods and literature review, whether or not international law is ready for mining operations in space. If so, then who has the ownership of mined resources? Does the international legislation offer clear guidelines on how to operate in space and is the law straightforward enough for space operations, such as mining, to be evaluated and operated in the large-scale as on-Earth mining. This thesis proposes, that if international law principles such as

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<sup>11</sup> Jakhu, Ram S., et al. (2016). Space Mining and Its Regulation. p.3-4

<sup>12</sup> Ferreira-Snyman, A. (2021). Challenges to the Prohibition on Sovereignty in Outer Space - A New Frontier for Space Governance. Potchefstroom Electronic Law Journal, 24, p.36

<sup>13</sup> Koch, J. S. (2018). Institutional Framework for the Province of all Mankind: Lessons from the International Seabed Authority for the Governance of Commercial Space Mining. *Astropolitics*, 16(1), 1–27. p.5-7

<sup>14</sup> Bielawski, R. (2020). Rare Earth Elements – a Novelty in Energy Security. *Journal of Ecological Engineering*, 21(4), 134–149. p.142-145

<sup>15</sup> Sovacool, B.K. (2021). When subterranean slavery supports sustainability transitions? power, patriarchy, and child labor in artisanal Congolese cobalt mining. *The Extractive Industries and Society*, 8(1), 271-293.

<sup>16</sup> Cockell, C. S. (2006). Space on Earth. New York Palgrave Macmillan Us. p.1-14

<sup>17</sup> Ferreira-Snyman (2021), *Supra nota* 12 p.35-36

common heritage of mankind and non-appropriation would be viewed as preemptory norms, law regulating outer space would change the approach that national legislations have taken. It compares how different laws have implemented non-appropriation-, the heritage of mankind- and international cooperation principles, and draws analogies between them to analyze the applicability towards outer space and its resources. This thesis will not focus on specific technological problems regarding mining operations.

The structure of the thesis is constructed in a way that the Chapter 1 outlines laws, legal framework and legal provisions of law on outer space. It shows how national legislations have created the legal framework that allows appropriation of outer space resources and contrasts it with international legislation. Chapter 2 sets forth present problems of current situation on-Earth and how there is urgency to adress problems regarding legal uncertainty of outer space laws. It also shows how connected these problems are to multiple topics. Chapter 3 presents legal provisions and principles that are a topic of discussions regarding legal uncertainty. Chapter proposes possible viewpoint on application of other international treaties that share similar legal principles, and shows thought process behind formation of the principles. Conclusion shows an possible proposition on how international principles could be viewed in order to control mining operations in outer space for limited time, before proper international entity could be formed to control such operations.



# 1. LAWS AND TREATIES ON OUTER SPACE MINING

In this chapter author focuses on United Nations treaties regarding outer space and domestic laws regarding outer space law, and the validity of mining operations in space in contrast to those. The most important international treaties concerning mining operations in space are The Outer Space Treaty (OST) and The Moon Agreement (MA). OST is signed by 111 countries, and is somewhat binding to all countries that have potential for space activities. The Moon Agreement however, is only signed by 18 countries and thus is not viewed as binding as OST. OST requires exploration and use of outer space to be carried out in benefit and interest of all countries.<sup>18</sup>

This has created a trend where states pass their own legislation concerning property rights in space. In 2015 president Obama passed legislation, in which § 51303 it is stated that U.S. citizens can appropriate space mined resources, and it allows its citizens to mine, sell and own space material.<sup>19</sup> In EU, Luxembourg has also created its own space laws and followed U.S. in passing legislation in the matters of privatization of space. It passed legislation similar to U.S, on July 20<sup>th</sup> 2017, where legal framework secures property rights for space resources.<sup>20</sup> Other laws that are worth mentioning are UN Convention on the Law of the Sea and the Antarctica treaty. Although completely different entities as the outer space, Antarctica and the seas, they share the same legal principles.

With various UN Resolutions, international law is seemingly starting to clarify and to condense into more specific set of rules.

These resolutions, specifically, United Nations General Assembly's 68 session, titled "Recommendations on national legislation relevant to the peaceful exploration and use of outer space" 68/74 shift the regulating entity away from the UN and international law, towards national legislation and jurisdiction.<sup>21</sup>

## 1.1. Outer Space Treaty

OST offers framework on how outer space operations should be viewed in legal perspective. The treaty itself offers mostly ambiguous guidelines to sanctioned actions in outer space. As said before,

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<sup>18</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Hereinafter OST) Annex

<sup>19</sup> U.S. Commercial Space Launch Competitiveness Act, 114th Congress, H.R.2262, Public Law 114-90, (2015-2016).

<sup>20</sup> Loi du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace.

<sup>21</sup> See generally, General Assembly Resolution 68/74, *Recommendations on national legislation relevant to the peaceful exploration and use of outer space*

the treaty entered into force in 1967, when operations in space were more sci-fi than reality. Still, it has standing as the most important international treaty regarding outer space activities.

Article 1 conradictorily states that exploration of outer space including the Moon and other celestial bodies is to be carried out in interest of all countries without taking into account states economic or scientific development. And, that the said bodies are free to be explored and used by all states in accordance with international law. It also encourages international co-operation between states to perform scientific research.<sup>22</sup> It requires contracting nations to establish “authorization and supervision” to have overview on activities of non-governmental organizations in outer space.<sup>23</sup> Outer space, Moon and other celestial bodies are not subject to national appropriation by claim of sovereignty. This includes occupation and other means.<sup>24</sup> In the annex of OST, it is expressed that exploration in space should be carried out in benefit of all people and that international co-operation should not only cover scientific development, but also legal aspects governing exploration and peaceful use of outer space.<sup>25</sup>

OST does not directly mention mining operations in outer space, but mentions that all activities in the exploration and use of outer space by state parties (governmental and non-governmental), are to be carried out in accordance with international law.<sup>26</sup> By definition, mining operations should be in the scope of “all activities” and in “exploration and use”.

As stated earlier, by some interpretations, OST allows governmental and non-governmental operations in the outer space if contracting nation authorizes and supervises the endeavor, and does not claim ownership on the celestial body.<sup>27</sup> Also, it requires the party in question to be transparent in actions to other nations and allow bodies of other space faring nations to enter into the respective area where operations are being conducted.<sup>28</sup>

Article 2 OST states that “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>29</sup> By this definition, outer space mining operations would fall into non-appropriation

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<sup>22</sup> Article I OST

<sup>23</sup> Article VI OST

<sup>24</sup> Article II OST

<sup>25</sup> Annex OST

<sup>26</sup> Article III OST

<sup>27</sup> *Supra nota* 19 & 20

<sup>28</sup> Article XII OST

<sup>29</sup> Article II OST

principle by state parties. Yet, it states that Moon and other celestial bodies are free to explore and use by all states. OST also dictates that states are responsible for national space activities whether they are carried out by governmental or non-governmental entities.<sup>30</sup>

## 1.2. The Moon Agreement

The Moon Agreement (MA), is United Nations Office for Outer Space Affairs (UNOOSA)'s agreement that governs activities of States on the Moon and other celestial bodies. It was adopted by General Assembly in 1979 in resolution 34/68, but it came into force later, in 1984.<sup>31</sup> MA takes parts from OST and clarifies and amplifies multiple parts of the agreement. One of the goals of the MA is to maintain the use of Moon and other celestial bodies purely for peaceful purposes.<sup>32</sup>

In Article 1 of the MA, it is stated that the provisions of the agreement are to be applied directly to other celestial bodies within the solar system (not Earth), but only before specific legal norms come into force regarding these celestial bodies.<sup>33</sup> According to Article 2, all activities on the Moon and other celestial should comply with international law.<sup>34</sup> Article 4 specifically states that all exploration and use of the Moon is province of mankind, and that it shall be used only in interest and benefit of all countries, regardless of scientific or economical advancement. The article also emphasises that the materials and scientific exploration should be for the present and future generations, and that they should be promoted to increase high standards of living and to promote economical- and social conditions.<sup>35</sup>

Article 3 takes into account the fact that all the state parties can only use the Moon for peaceful purposes. All threat and acts of hostile force are strictly prohibited on Moon and in orbits.<sup>36</sup> Ban also applies to all military fortifications such as barriers, bases, testing grounds and military manouvers. However, military personnel used for scientific research and peaceful purposes are not prohibited by the agreement.<sup>37</sup> The Article 11 of the MA clarifies non-appropriation principle of

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<sup>30</sup> Article VI OST

<sup>31</sup> General Assembly Resolution 34/68, Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, A/RES/34/68. Entry into force 1984.

<sup>32</sup> The Moon Agreement Article 3

<sup>33</sup> *Ibid.* Article 1

<sup>34</sup> *Ibid.* Article 2

<sup>35</sup> *Ibid.* Article 4

<sup>36</sup> The Moon Agreement Article 3

<sup>37</sup> *Ibid.*

the OST. Here, non-appropriation has been extended to include principles applicability into the Moon altogether and also towards natural resources. The principle is also applicable to non-governmental- and international intergovernmental entities and natural persons.<sup>38</sup> Article 11 also considers natural resources of the Moon and other celestial bodies in solar system as common heritage of mankind.<sup>39</sup>

Importantly, this author thinks that the MA takes into consideration the use and purposes of the Moon and other celestial beings extremely detailed, in comparison to the OST. However, it is only signed by 11 Nations, and all of the most advanced nations regarding space travel and research, such as USA, China, Russia, Japan, are not part of it.<sup>40</sup> Thus, it has not gained the same legislative standing in international law as the OST.

### **1.3. UN Resolutions Regarding Outer Space**

The UN resolution 68/74 is general assembly's 68<sup>th</sup> session 16<sup>th</sup> of December 2013, and it is titled "Recommendations on national legislation relevant to the peaceful exploration and use of outer space".<sup>41</sup> The resolution specifies and underlines that the use of outer space should be used only for peaceful purposes and that the international law and its obligations are to be implemented.<sup>42</sup> It also recognizes the growing interest of non-governmental parties towards outer space, and notes that specific actions needed from national levels regarding authorization and supervision of non governmental space activities.<sup>43</sup> Said supervision is mentioned and specified as "...practical regulatory system for the involvement of non-governmental entities to provide further incentives for enacting regulatory frameworks at the national level, and noting that some States also include national space activities of a governmental character within that framework...",<sup>44</sup> Also, the resolution acknowledges that nations have different methods of conducting space related activities

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<sup>38</sup> *Ibid.* Article 11

<sup>39</sup> *Ibid.*

<sup>40</sup> United Nations Treaty Collection, Status of "Agreement governing the Activities of States on the Moon and Other Celestial Bodies", entry into force 11 July 1984. Retrieved from: [https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg\\_no=XXIV-2&chapter=24&clang=\\_en](https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXIV-2&chapter=24&clang=_en) 6 December 2021

<sup>41</sup> General Assembly Resolution 68/74, *Recommendations on national legislation relevant to the peaceful exploration and use of outer space*, A/RES/68/74, (11 December 2013)

<sup>42</sup> *Ibid*

<sup>43</sup> *Ibid*

<sup>44</sup> *Supra nota* 41

and that those methods have tremendous variability in the range of the activities and in the involvement of the governmental and non-governmental institutions.<sup>45</sup>

UN has established a point of view in its most recent resolution concerning outer space. In resolution 72/78, adopted by General Assembly on 7th December 2017, UN General Assembly remembered OST on the treaties 50th anniversary, and confirmed that the OST and its principles are “indispensable framework“ in conducting activities in outer space.<sup>46</sup> It also reaffirms treaties position as fundamental part in maintaining peace and security, and promoting international cooperation in outer space.<sup>47</sup> Resolution acknowledges that development of science and technology in space are for the benefit of all humankind, and that treaty is essential in governing international legal regime.<sup>48</sup>

There is legal uncertainty regarding UN resolutions, specifically in nature of resolutions bindingness. There is debate over if these resolutions are enforceable.<sup>49</sup> The lack of enforceability is argued to hinder effectiveness of these resolutions as international binding law.<sup>50</sup> There is a consensus that enforceability and bindingness of General Assembly’s resolutions depend on willingness of State authorities to demand obedience to these resolutions.<sup>51</sup>

## **1.4. Domestic Law**

### **1.4.1 The United States of America**

In 2015 Commercial Space Launch Competitiveness Act (2015 SPACE Act) was passed in Congress.<sup>52</sup> It’s main purpose is to aid and grow the political and economical environment of the commercial space industry.<sup>53</sup> In its own words the goal should happen by “encouraging private sector investment and creating more stable and predictable regulatory conditions”<sup>54</sup> It also aims to

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<sup>45</sup> *Ibid.*

<sup>46</sup> General Assembly Resolution 72/78, *Declaration on the fiftieth anniversary of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, A/RES/72/78, 7 December 2017, section 5

<sup>47</sup> *Ibid* note 4

<sup>48</sup> *Ibid* note 6 & 15

<sup>49</sup> Castles, A. C. (1967). Legal Status of U.N. Resolutions. *Adelaide Law Review*, 3(1). p.70

<sup>50</sup> *Ibid.*

<sup>51</sup> *Ibid.* p.83

<sup>52</sup> *Supra nota* 19

<sup>53</sup> *Supra nota* 19

<sup>54</sup> *Ibid.*

create better suited atmosphere for private competitiveness and entrepreneurship in private aerospace industry.<sup>55</sup>

In § 51303 of the Act, it is stated that US citizen, who is engaged in commercial recovery of space resource, is entitled to “possess, own, transport, use and sell” the said resource. So, the US legislation gives a right to possess space objects by sovereign claim.<sup>56</sup> To solidify this position, President Donald Trump issued executive order on encouraging international support of the recovery and use of space resources in April 6<sup>th</sup> 2020.<sup>57</sup> According to the executive order, successful exploration will require commercial entities to recover and use the resources gathered from outer space objects, such as minerals, water etc.<sup>58</sup> Also, President Trump stated that “Americans should have the right to engage in commercial exploration, and use of resources in outer space...” and that “...Outer space is a legally and physically unique domain of human activity, and the United States does not view it as a global commons...” In the section 2 of the order, it is mentioned that The United States is not party to The Moon Agreement, and that The United States does not view it as “effective or necessary” instrument in regulating the Outer Space.<sup>59</sup> Furthermore, “...the Secretary of State shall object to any attempt by any other state or international organization to treat the Moon Agreement as reflecting or otherwise expressing customary international law.”<sup>60</sup>

#### **1.4.2 Luxembourg**

Luxembourg has established itself as one of the leading European countries regarding space legislation.<sup>61</sup> Growing interest for space, that’s been revitalized by modern technological advancements and involvement by powerful private actors (Bezos, Musk etc.), has led to countries starting to draft their own space related legislations.<sup>62</sup>

Luxembourg adopted the “Space Act” in 15<sup>th</sup> of December 2020. The Space Act is in relation to Exploration and Use of Space Resources Act 2017 (the "Space Resources Act") and it applies to

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<sup>55</sup> *Ibid.*

<sup>56</sup> *Ibid.*

<sup>57</sup> The Executive Order No. 13914, 85 Federal Regulation. 20381. (6 April, 2020)

<sup>58</sup> *Ibid.*

<sup>59</sup> *Ibid.*

<sup>60</sup> *Ibid.*

<sup>61</sup> Calmes, B., Schummer, L., and Gladysz-Lehmann, B. (2021). *The Space Law Review: Luxembourg*, The Space Law Review Edition 3. Accessed <https://thelawreviews.co.uk/title/the-space-law-review/luxembourg>

<sup>62</sup> See Supra note 19 & 20

all space related activities that fall within Luxembourg's jurisdiction, taken it is not covered by the latter legislation.<sup>63</sup> The Space Act applies to space activities that are carried out:

“by an operator, whatever the nationality thereof, from the territory of the Grand Duchy of Luxembourg or by means of installations, whether movable or immovable, under the control and jurisdiction of the Grand Duchy of Luxembourg; or  
in the territory of a foreign State or an area not subject to the sovereignty of a State by natural persons of Luxembourg nationality or by legal persons established under Luxembourg law. This Law shall not apply to missions involving the exploration and use of space resources governed by the Law of 20 July 2017 on the exploration and use of space resources, except for Articles 15 and 16, paragraph 2. “ And, the Space Act covers space activities as “any activity consisting in launching or attempting to launch one or more space objects into outer space or in controlling one or more space objects or in using them during a stay in outer space, including the return to Earth, as well as any other activity taking place in outer space for which the Grand Duchy of Luxembourg is likely to be held internationally liable;<sup>64</sup>.”

Article 4 shifts the liability of damages onto the “operator”, starting from preparation phase into the voyage. Authorisation of the space operations is appropriated in the chapter 2 Article 5. Government will give authorisation to every space operator, and without the said authorisation, operation cannot be exercised. It is also worth mentioning that the authorisation is personal and it cannot be assigned to another party.<sup>65</sup>

Aforementioned, Luxembourg has legal act titled “Law of July 20<sup>th</sup> 2017 on the Exploration and Use of Space Resources”. In the Article 1, it is clearly stated that “Space resources are capable of being owned”. Authorisation to these operations is only given by ministers of economy and space activities.<sup>66</sup> Furthermore, without the authorisation, space resources acquired through exploration in outer space, cannot be appropriated.<sup>67</sup>

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<sup>63</sup> Loi du 15 décembre 2020 portant sur les activités spatiales.

<sup>64</sup> *Ibid.*

<sup>65</sup> *Ibid.*

<sup>66</sup> *Supra nota* 20

<sup>67</sup> *Ibid* Art. 2

Luxembourg is leaning towards international co-operation, as it signed memorandum of cooperation (MoE) with Japan<sup>68</sup>, Czech Republic<sup>69</sup>, the United States<sup>70</sup> and more. Memorandum's (with the US) purpose is to act as a channel in order to generate dialogue and share expertise between the nations. Both countries are recognising possibilities of the new industry and are keen on leading the international community with legal framework that puts emphasis on private-owned entrepreneurships and companies.<sup>71</sup>

U.S Secretary of Commerce Wilbur Ross commented the memorandum as a way to “increase collaboration across wide range of space activities, including research, exploration, defence and space commerce.” He also commented that the partnership allows channel for discussion on topics related on problems like space debris and regulatory reform.<sup>72</sup>

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<sup>68</sup> Luxembourg Ministry of the Economy. (2017, November 29). *Luxembourg and Japan agree to cooperate on exploration and commercial utilization of space resources* [Press release]. <https://space-agency.public.lu/dam-assets/press-release/2017/2017-11-29-press-release-mou-japan-space.pdf> retrieved 10.11.2021

<sup>69</sup> Luxembourg Ministry of the Economy. (2018, October 10). *Luxembourg and the Czech Republic cooperate in the frame of space resources exploration and utilization* [Press release]. <https://space-agency.public.lu/dam-assets/press-release/2018/2018-10-10-Press-release-MoU-Czech-Lux-FINAL.pdf> retrieved 10.11.2021

<sup>70</sup> Luxembourg Ministry of the Economy, the U.S. Department of Commerce and the U.S. Embassy, Luxembourg. (2019, May 10). *United States and Luxembourg sign memorandum on space co-operation* [Press release]. [https://space-agency.public.lu/content/dam/space\\_agency/news1/2019-05-10-Press-release-Space-MoU-USA-LUX.pdf](https://space-agency.public.lu/content/dam/space_agency/news1/2019-05-10-Press-release-Space-MoU-USA-LUX.pdf) Retrieved 12.11.2021

<sup>71</sup> *Ibid.*

<sup>72</sup> *Ibid.*



## 2. The Need For State-of-the-Art Space Legislation

There is evergrowing interest towards space and more specifically, for commercial use of it. We are experiencing quick degeneration of natural resources, and according to studies, we are using 173% of Earth's bio-capacity. This means we are using resources on faster pace than nature can grow back.<sup>73</sup> Bio-capacity is counted unit relative to population, which in terms means that with the exponential growth of human population we have experienced within last few decades<sup>74</sup>, things are only getting worse. Luckily for us, we have access to endless space around us, which has abundance of natural resources such as metals, rocks, water (ice) and gases.<sup>75</sup> If we can transfer our on-Earth mining operations into space, we could solve multiple problems regarding air pollution, environmental- and landscape destruction and exhaustion of natural resource nodes etc.<sup>76</sup> It is necessary to point out that mining is major livelihood in multiple countries, and taking it away would also create socio-economical problems.

Multiple governmental agencies and private entities have issued statements of future endeavours into space.<sup>77</sup> One of the most important recent statements was that of NASA's Artemis program<sup>78</sup>, where it is set to buy lunar regolith from a private company, which will mine and deliver it to NASA. NASA states that it hopes to purchase the materials at later date, arguably during the manned operation to the Moon.<sup>79</sup> As stated by Alex Gilbert and Morgan Bazilian, "NASA's proposal heralds the era of commercial space resources extraction. It also demonstrates the power of government to help catalyse markets and innovation."<sup>80</sup> The exchange of materials and ownership is expected to happen on the Moon.<sup>81</sup> The exchange is

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<sup>73</sup> Wackernagel, M., Hanscom, L., Jayasinghe, P., Lin, D., Murthy, A., Neill, E., & Raven, P. (2021). The importance of resource security for poverty eradication. *Nature Sustainability*, 4(8) p.735

<sup>74</sup> Roser, M., Ritchie, H. and Ortiz-Ospina, E. (2013). World Population Growth. *Our World in Data*. [online] Available at: <https://ourworldindata.org/world-population-growth#>

<sup>75</sup> Anderson, S. W., Christensen, K., & LaManna, J. (2018). The development of natural resources in outer space. *Journal of Energy & Natural Resources Law*, 37(2), 227–258.

<sup>76</sup> Stewart, A.G. (2019). Mining is bad for health: a voyage of discovery. *Environmental Geochemistry and Health*, 42.

<sup>77</sup> Koren (2019), *Supra nota 4*

<sup>78</sup> National Aeronautics and Space Administration. (2020). *NASA's Lunar Exploration Program Overview*. Retrieved from: [https://www.nasa.gov/sites/default/files/atoms/files/artemis\\_plan-20200921.pdf](https://www.nasa.gov/sites/default/files/atoms/files/artemis_plan-20200921.pdf) p.28-29 1 December 2021.

<sup>79</sup> *Ibid*

<sup>80</sup> Gilbert, A. and Bazilian, M. (2020). The Era of Commercial Space Mining Begins. [online] Retrieved from: <https://payneinstitute.mines.edu/wp-content/uploads/sites/149/2020/09/Payne-Institute-Commentary-The-Era-of-Commercial-Space-Mining-Begins.pdf>, 1 December 2021. p.1

<sup>81</sup> National Aeronautics and Space Administration. (2020). *NASA's Lunar Exploration Program Overview*. Retrieved from: [https://www.nasa.gov/sites/default/files/atoms/files/artemis\\_plan-20200921.pdf](https://www.nasa.gov/sites/default/files/atoms/files/artemis_plan-20200921.pdf) p.28-29 1 December 2021.

expected to establish a precedent, which will most likely create a whole narrative how mining and commercial operations are expected to happen in the future.<sup>82</sup>

Some authors argue that excessive legislation and new laws are hindering economical activity and generating barriers for individuals to take part in business and communities.<sup>83</sup> Throughout history, laws have been essential for people living in community, and that laws have provided general safety. But how to operate, when law, such as law regarding outer space, is arguably too vague. The implications for the lack of dependable framework could be devastating.<sup>84</sup> A good example could be what happened in California during gold rush in 1848, where only rule that was applied was “first come, first served“. California was bursting with people eager to find wealth from all over the America and Europe, and left the State with economic disparities, racism, overpopulation and ever growing cost of living.<sup>85</sup> These are also the problems we are facing and trending towards in developing countries, where corporations and a few businesspersons accumulate majority of the wealth available, and leave rest of the population near poverty. This, however, may not be entirely due to lack of legal framework, but it is necessary to point out that the problem exists.

As more governmental and non-governmental organizations begin steering their focus towards outer space, dependable framework is required. Uncertainty regarding legislation hinders investments and innovation, it also creates obstacles towards utilization of natural resources.<sup>86</sup> Also, it could be argued that it is in interest of all mankind to have dependable framework that prevents possible conflicts between nations.

Impacts of global warming, such as rising of the sea level, frequent storms and overall temperature increase can render Earth uninhabitable at worst. Mining operations and the waste disposal on site are considered to be among the main sources of environmental destruction,

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<sup>82</sup> *Supra nota* 81. p. 29

<sup>83</sup> Office of the Parliamentary Counsel. (2013). When Laws Become Too Complex. Cabinet Office. Retrieved from: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/187015/GoodLaw\\_report\\_8April\\_AP.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/187015/GoodLaw_report_8April_AP.pdf) 3 December 2021

<sup>84</sup> Ferreira-Snyman (2021) *Supra nota* 12 p.36

<sup>85</sup> Brandt, L. R. (2016). *Social Problems During California's Gold Rush Presaged Those We Face Today*. [online] UC Berkeley Library Update. Retrieved from: <https://update.lib.berkeley.edu/2016/09/21/social-problems-during-californias-gold-rush-presaged-those-we-face-today-2/>. 2 December 2021

<sup>86</sup> Jakhu, R., & Buzdugan, M. (2008). Development of the Natural Resources of the Moon and Other Celestial Bodies: Economic and Legal Aspects. *Astropolitics*, 6(3), 201–250. p.219

especially in developing countries.<sup>87</sup> Studies show that rock waste from mining are dumped to the sea, destroying fragile eco-system of the ocean.<sup>88</sup> These dumps also alter landscape, and residue from metal rich soil pollutes the environment and poses a threat to agriculture and human health.<sup>89</sup>

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<sup>87</sup> McKinnon, E. (2002). "The environmental effects of mining waste disposal at Lihir Gold Mine, Papua New Guinea". *Journal of Rural and Remote Environmental Health* 1(2): 40-50.

<sup>88</sup> *Ibid.* p.43

<sup>89</sup> Festin, E. S., Tigabu, M., Chileshe, M. N., Syampungani, S., & Odén, P. C. (2018). Progresses in restoration of post-mining landscape in Africa. *Journal of Forestry Research*, 30(2), 381–396. p.381

### 3. Problems in Interpretation of Legislation on Outer Space Mining

The first chapter outlined the legal framework regarding outer space, and specifically outer space mining. OST relies heavily on non-appropriation principle, which can be viewed as troublesome in the light of new legislation passed on in Luxembourg<sup>90</sup> and in the United States<sup>91</sup>. These newly adopted laws appear to be circumventing the non-appropriation principle by not appropriating the asteroid, but appropriating the mined minerals from it. According to Russian media, their representative Gloria Agaranova in the UN has noted 26th October 2021 in fourth committee of the UN General Assembly that, OST and its norms are fully applicable in context with resources on the moon and other celestial beings. Having emphasis on international cooperation on issues of peaceful exploration and use of the outer space, and that these issues should be viewed in the light of universally accepted norms and principles of the international law. She also stated that all of the principles and norms of the OST are fully applicable to space resources as well as celestial bodies and the Moon.<sup>92</sup>

The interpretation of laws regarding ownership and appropriation of objects in space is troublesome. As seen in OST, the framework is quite vague and it lacks the specific guidelines for operators to act upon. This problem was acknowledged and the MA was drafted, however, as stated before, it did not reach the necessary signatures from the advanced space-faring nations to become significant legal framework.<sup>93</sup> Also, as pointed out in chapter 1.4.1, President Donald Trump explicitly stated that the USA is not part of the MA and none of the principles laid out in it apply to USA.<sup>94</sup> The formatting of many of the international treaties regarding shared, mineral-rich areas with national claims, such as deep seabed, Antarctica and space share the same principles. These principles could be argued to have a status of *ius cogens*, peremptory norms.<sup>95</sup> By definition, it is a “...norm accepted and recognized by the international community of States as a whole as a norm from which no derogation is permitted and which can be modified only by a subsequent norm of

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<sup>90</sup> *Supra nota 20*

<sup>91</sup> *Supra nota 19*

<sup>92</sup> Russia believes that 1967 Outer Space Treaty applicable to Moon's resources, diplomat says. (2021). TASS. Retrieved from: <https://tass.com/science/1354013> 2 December 2021

<sup>93</sup> Doyle, S. E. (1998). Using Extraterrestrial Resources under the Moon Agreement of 1979. *Journal of Space Law*, 26(2), 111-128. p.127

<sup>94</sup> *Supra nota 57*

<sup>95</sup> Tronchetti, F. (2007). The Non-Appropriation Principle Under Attack: Using Article II of the Outer Space Treaty in its Defence. *International Aeronautical Federation*. p.9-11

general international law having the same character.”<sup>96</sup> and the function of the norm is to “reflect and protect fundamental values of the international community, are hierarchically superior to other rules of international law and are universally applicable.”<sup>97</sup> Furthermore, these principles could be argued to have international obligations *erga omnes*, which in terms means that all states have a legal interest towards a certain subject (space, Antarctica, deep sea) and that it is of importance to everyone in international community.<sup>98</sup> This author proposes that, if MA and its principles would be considered as customary law and moreover, *ius cogens*, problems regarding interpretation of the applicability of the OST article 2 specifically, would be somewhat simpler.

However, some authors would prefer more “direct“ approach in terms of legal disputes over property rights in space. For example, Wrench, argues that the non-appropriation principle can be overlooked.<sup>99</sup> And that prior appropriation doctrine could be used to determine property rights over mined resources.<sup>100</sup> OST dictates that the outer space or objects cannot be under sovereign ownership but it allows exploration and use in scientific purposes.<sup>101</sup> But according to Wrench, without violating the principle of non-appropriation, parties could extract resources without wasteful use from the celestial beings and this way acquire property rights.<sup>102</sup> Much like the US and Luxembourg have done with respective domestic laws.<sup>103</sup> Smith also shares the idea that commercial use of space and colonialization is the next logical step for humanity, but he also agrees that fairness has to be ensured along with monopolies over exploitable resources.<sup>104</sup> He suggests that multilateral negotiations would be necessary before national appropriation of space begins.<sup>105</sup> There are also fears of international conflicts in space, when two nations race for exploitation of the same resource node. Reinstein proposes hypothetically solution, that a centralized organization<sup>106</sup> could be appointed, which would be international body with legitimacy of United Nations. This organization would oversee space development of private companies without

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<sup>96</sup> United Nations, General Assembly, (2019). *Report of the International Law Commission*, A/74/10. p.142

<sup>97</sup> *Ibid.* p.142

<sup>98</sup> Byers, M. (1997). Conceptualising the Relationship between Jus Cogens and Erga Omnes Rules. *Nordic Journal of International Law*, 66(Issues 2-3), 211-240.

<sup>99</sup> Wrench, J. G. (2019). Non-Appropriation, No Problem: The Outer Space Treaty Is Ready for Asteroid Mining. *Case W. Res. J. Int'l L.*, 51, pp.437-462

<sup>100</sup> *Ibid.* p.456-460

<sup>101</sup> OST Article II

<sup>102</sup> Wrench (2019), *Supra nota* 99 p.460-461

<sup>103</sup> *Supra nota* 19 & 20

<sup>104</sup> Smith, M.T. (2020). One Small Plot For A Man, Or One Giant Easement For Mankind?: A New Approach to the Outer Space Treaty's Property For Mankind Principle. *University Of Illinois Law Review*, 2020, p.1385

<sup>105</sup> *Ibid.*

<sup>106</sup> Reinstein, E.J. (1999). Owning Outer Space. *Northwestern Journal of International Law & Business*, 20,(1). 59-98. p. 84-87

damaging international relations, and it would ensure fair competition between interested parties in space.<sup>107</sup>

With UN Resolution 68/74, international law could be argued to be trending towards allowing national legislation to ameliorate the sector, and add to existing the legal frameworks.<sup>108</sup>

Countries that are advanced scientifically appear to be reluctant in accepting the common heritage principle.<sup>109</sup> Buxton thinks that human is incapable of growing out of the greed of being the best, without compelling reason that threatens the existense of our race.<sup>110</sup> He argues that only the nations without any possible way of exploiting resources in space, demand equal distribution of the riches found in space.<sup>111</sup>

### **3.1. Principles Governing the Law of Space**

United Nations Office for Outer Space Affairs (UNOOSA) has resolution that has been adopted by the General Assembly regarding principles in Space. It is called Declaration of Legal Principles Governing the Activities of states in the Exploration and Use of Outer Space (1962 (XVIII)). In the resolution, are listed the main principles that should be used in as guidelines by States in exploration and use of Outer Space.<sup>112</sup>

The use and exploration of outer space is to be carried out in benefit of all mankind. It is also mentioned that all states have equal right for exploration and use of the outer space and celestial bodies, but only in accordance with international law. There shall be no national appropriation of any kind and that every activity of states shall only be carried out in accordance with international law and the Charter of the United Nations. And that these actions should maintain international peace, security and promoting international cooperation and understanding. Furthermore, States have obligation to international responsibility for actions in space, whether it is governmental or

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<sup>107</sup> Reinstein (1999), *Supra nota* 106 p.84-87

<sup>108</sup> *Supra nota* 21

<sup>109</sup> Buxton, C.R. (2004). Property in Outer Space: The Common Heritage of Mankind Principle vs. the First in Time, First in Right, Rule of Property. *Journal of Air Law and Commerce*,69,(4), pp.689-707 p.706

<sup>110</sup> *Ibid.* p.706

<sup>111</sup> *Ibid.* p.706

<sup>112</sup> United Nations, General Assembly. Resolution 1962 (XVIII). Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space. Retrieved from: <https://www.unoosa.org/oosa/en/ourwork/spacelaw/principles/legal-principles.html> 6 December 2021

non-governmental entity operating. Nations also have obligation to guarantee the obedience of all the notions of the resolution by their entities.<sup>113</sup>

As Article 2 of OST states “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>114</sup> This principle is known as the non-appropriation principle. The same principle can be found on The Moon Agreement, Antarctica Treaty and in LOS.<sup>115</sup> It is argued that non-appropriation principle is the most important principle to define in order to determine is it possible to allow mining operations and resource gathering in space in regards of international law.<sup>116</sup>

With introduction to another major principle, it is necessary to point out the historical meaning and thoughts that have driven the process. With these notes, it is possible to examine the thought process and concerns that led to formulation of one of the major principles regarding outer space.

As discussed before, one of the commanding principles of international law, and specifically law regarding outer space, is the common heritage of mankind principle. It can be found on OST, MA, LOS and Antarctica Treaty.<sup>117</sup> The principle itself is relatively new, since it was first advocated in LOS concerning deep sea. It was Maltese Dr Arvid Padro, who introduced the principle 1st of November, 1967 in UN’s 1515<sup>th</sup> meeting of the General Assembly.<sup>118</sup> He stated in his speech that “The examination of the question of the reservation exclusively for peaceful purposes of the sea bed and ocean floor and the sub-soil thereof, underlying the high seas beyond the limits of present national jurisdiction, and their use of resources in the interests of mankind.”<sup>119</sup> Pardo mentioned the vision in his speech, where he could extract metals and minerals such as gold, silver and calcium etc. from the sea. Unfortunately at that time, it required more wealth to make the trip, than materials gathered would provide.<sup>120</sup> We share the same problem now, but with outer space mining. The costs of retrieval require more resources than what we can accumulate from the mining. Pardo was also concerned about fish husbandry and commercial ocean farming, and more specifically, about the national appropriation and commercial exploitation of the abundant riches of the deep

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<sup>113</sup> *Supra nota* 112

<sup>114</sup> Article II OST

<sup>115</sup> The Moon Agreement Article 11 par 2, The Antarctic Treaty Article IV, UN Convention on the Law of the Sea (hereinafer LOS) Article 137

<sup>116</sup> Tronchetti (2017) *Supra nota* 95 p.8-10

<sup>117</sup> OST Article I, The Moon Agreement Article 4, LOS Article 136, Antarctica Treaty Preamble

<sup>118</sup> United Nations, General Assembly. (1967). A/C.1/PV.1515, New York.

<sup>119</sup> *Ibid.* p.1 section 3

<sup>120</sup> *Ibid.* p.2 section 16

seabed.<sup>121</sup> At that time there were already leases granted for certain mineral deposits.<sup>122</sup> He addressed the exponential growth of monetary investments and interest towards public and private technological research of the most developed countries (USA, Soviet Union, France) as “far earlier break-throughs”, and that those result in making “commercial exploitation of the ocean floor possible”.<sup>123</sup> Now, in the era where mining in space is growing, these thoughts of Padro can almost all be directly linked to it, and that the arguments could also be applicable to modern problems. On a different note in developing the common heritage principle, was a deep concern that major powers have security and defence obligations towards national appropriation of the mineral rich areas.<sup>124</sup> He stated that the more technological development and scientific progress we produce, interest towards sea and its riches grows even more.<sup>125</sup> A statement, which could also be directly applied into current situation. Lastly, Padro thought that it is only a matter of time when these riches are going to be mined from the seabed, and that the only question is will the riches be mined under “national auspices for national purposes” or “under international auspices and for the benefit of mankind”<sup>126</sup> He feared that the most technologically advanced nations would benefit from the riches of the seabed and accumulate the wealth to share together, while less developed countries could not participate.<sup>127</sup>

There is also alternative interpretation of the international law regarding non-appropriation. It is that non-appropriation principle can be overlooked and principle of prior appropriation would be applicable.<sup>128</sup> This interpretation of OST Article 2 could be leaning the emphasis over from non-appropriation towards sanctioned extraction.<sup>129</sup> The prior appropriation doctrine has been used to determine water rights in the United States. It essentially means that the first person to appropriate water has the exclusive right to it. Continuance of the appropriation is directly linked to beneficial use – this right can be lost if appropriator does not exercise continuance of the use.<sup>130</sup>

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<sup>121</sup> *Supra nota* 118 p.5

<sup>122</sup> *Ibid.* p.5

<sup>123</sup> *Ibid.* p.5

<sup>124</sup> *Ibid.* p.6

<sup>125</sup> *Ibid.* p.6

<sup>126</sup> *Ibid.* p.8-9

<sup>127</sup> *Ibid.* p.8-9

<sup>128</sup> Wrench (2019), *Supra nota* 99. See generally

<sup>129</sup> *Ibid.*

<sup>130</sup> Gopalakrishnan, C. (1973). The Doctrine of Prior Appropriation and Its Impact on Water Development: A Critical Survey. *The American Journal of Economics and Sociology*, 32(1), 61–72. p.62-63



As discussed earlier, OST has also included freedom of scientific research, freedom of access and benefit sharing and environmental stewardship into common heritage principle.<sup>131</sup> Environmental stewardship is part of UN Comitee’s guidelines on the peaceful use of Outer Space.<sup>132</sup> Its goal is long-term sustainability of outer space activities. The meeting took part in Vienna 20-29 June, 2018. Even though environmental stewardship is not directly related to subject in question, it is worthwhile to point out its provision on voluntary implementation of the guidelines. It states that international intergovernmental organizations, that are in a position to support developing countries in implementation of the guidelines are encouraged to do so. According to the notion, this would ensure and enhance long-term sustainability of outer space.<sup>133</sup> The comitee introduced the idea of international cooperation in a following way. It is stated that:

“International cooperation is required to implement the guidelines effectively, to monitor their impact and effectiveness and to ensure that, as space activities evolve, they continue to reflect the most current state of knowledge of pertinent factors influencing the long-term sustainability of outer space activities, particularly with regard to the identification of factors that influence the nature and magnitude of risks associated with various aspects of space activities or that may give rise to potentially hazardous situations and developments in the space environment.”<sup>134</sup>

### **3.2. Antarctica & Law of the Seas Approach**

Space offers a unique playground for exploration and exploitation. As stated previously, one of the biggest problems of the OST and space law in general, is contradictory interpretation of the Article 2 regarding ownership and appropriation of objects in deep space.<sup>135</sup> However, similiar rules have been made on the Earth to prevent ownership of places of similiar interest.<sup>136</sup> These are the High Seas and Antarctica. This author argues that there is a possibility for interpretation of space laws in the light of the United Nations Convention on the Law of the Sea, December 10<sup>th</sup> , 1982,

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<sup>131</sup> OST in general

<sup>132</sup> United Nations, Committee on the Peaceful Uses of Outer Space (2018). Guidelines for the Long-term Sustainability of Outer Space Activities. A/AC.105/2018/CRP.20

<sup>133</sup> *Ibid.* p.4

<sup>134</sup> *Ibid.* section 20, p.4

<sup>135</sup> Tronchetti (2007) and Wrench (2019), *Supra nota* 95 & 99

<sup>136</sup> Convention on the Law of the Sea, December 10<sup>th</sup> , 1982, (Afterwards LOS) and and the Antarctica Treaty, signed December 1<sup>st</sup> 1959 and effective from June 23<sup>rd</sup> 1961

(Afterwards LOS)<sup>137</sup> and the Antarctica Treaty, signed December 1<sup>st</sup> 1959 and effective from June 23<sup>rd</sup> 1961.<sup>138</sup>

It is also important to mention, that while space law and high seas do not allow national appropriation, the Antarctica treaty has territorial claims suspended as of June 23<sup>rd</sup>, 1961.<sup>139</sup> These UN conventions could be analyzed in a way that makes them, and the principles they contain, customary international law.<sup>140</sup>

In the forewords of Antarctica treaty, it is stated that it is in the interest of all humankind that Antarctica is and will always be used only for peaceful purposes, and that it does not turn into a “scene or object of international discord”.<sup>141</sup> Goal of the treaty is also, “Acknowledging the substantial contributions to scientific knowledge resulting from international cooperation in scientific investigation in Antarctica”<sup>142</sup> and to recognize and continue the international harmony and solely peaceful use of the Antarctica.<sup>143</sup> Article 1 of the Antarctica Treaty has virtually the same meaning as OST Article 4, that Antarctica shall only be used for peaceful purposes.<sup>144</sup> Article 3 promotes international co-operation in science by the means of information sharing and transparency in scientific operations.<sup>145</sup> Antarctica Treaty has a solution for obedience of the treaty and ensurance of the objectives agreed upon, in the Article 7. Here, contracting parties can establish a representative to observe and investigate any operations without interruption from other contracting states.<sup>146</sup> Dispute settlement is defined in Article 11, by first among the two parties having the dispute, with peaceful means such as but not limited to “negotiation, inquiry, mediation, conciliation, arbitration, judicial settlement” and if these means are inadequate, dispute parties are referred to International Court of Justice if they so consent.<sup>147</sup>

LOS is more specific and longer agreement than the Antarctic Treaty. In the preamble of LOS, there is an agreement of the contracting parties that there is a devotion to co-operation and demand

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<sup>137</sup> United Nations Convention on the Law of the Seas Retrieved from: [https://www.un.org/depts/los/convention\\_agreements/texts/unclos/unclos\\_e.pdf](https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf) 10 December 2021

<sup>138</sup> The Antarctic Treaty, 402 U.N.T.S. 71, entered into force June 23, 1961. Retrieved from: <https://treaties.un.org/doc/Publication/UNTS/Volume%20402/volume-402-I-5778-English.pdf> 10 December 2021

<sup>139</sup> *Ibid.* Article IV

<sup>140</sup> Tronchetti (2007), *Supra nota* 95 p.4-7

<sup>141</sup> The Antarctic Treaty preamble

<sup>142</sup> *Ibid.*

<sup>143</sup> *Ibid.*

<sup>144</sup> *Ibid.* Article I

<sup>145</sup> *Ibid.* Article III

<sup>146</sup> *Ibid.* Article VII

<sup>147</sup> *Ibid.* Article XI

for settling issues in contribution to cultivate justice, peace and progress of all humankind.<sup>148</sup> Furthermore, Article 136 states The Area<sup>149</sup> and its resources to be common heritage of mankind.<sup>150</sup> The parties are aware that instituting legal framework through the convention, will aid international discussion, promote peaceful use of the seas and preserve the environment.<sup>151</sup> The LOS is also aiming to contribute on nondiscriminatory, economical order which benefits the needs and interests of humankind en masse.<sup>152</sup> Lastly, it is mentioned that progressive development of the law will subsidize “strengthening of peace, security, cooperation and friendly relations among all nations in conformity with the principles of justice and equal rights and will promote the economic and social advancement of all peoples of the world”<sup>153</sup>

Briefly, it is worth mentioning that LOS describes exclusive economic zone in articles 55 to 75. The same wording and principle could be applicable and associable to asteroid belts. Exclusive economic zone is an area beyond and adjacent to the territorial sea.<sup>154</sup>

The principles that govern Article 137 is virtually a non-appropriation paragraph, just like the OST Article 2. It is put into words as “No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof. No such claim or exercise of sovereignty or sovereign rights nor such appropriation shall be recognized.”<sup>155</sup> Second part of the Article specifies ownership followingly, “All rights in the resources of the Area are vested in mankind as a whole, on whose behalf the Authority shall act. These resources are not subject to alienation. The minerals recovered from the Area, however, may only be alienated in accordance with this Part and the rules, regulations and procedures of the Authority.”<sup>156</sup> There is also a notion that prevents state or natural or juridical persons claims towards recovered minerals, and that suchs claims to ownership are not to be recognized.<sup>157</sup>

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<sup>148</sup> LOS Preamble

<sup>149</sup> “In the context of the United Nations Convention on the Law of the Sea, the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction.” United Nations Convention on the Law of the Sea (UNCLOS) 1982, Article 1

<sup>150</sup> LOS Article 136

<sup>151</sup> LOS Preamble

<sup>152</sup> *Ibid.*

<sup>153</sup> *Ibid.*

<sup>154</sup> LOS Article 55

<sup>155</sup> LOS Article 137

<sup>156</sup> LOS Article 137 section 2

<sup>157</sup> LOS Article 137 section 3

In LOS, there is specifically mentioned in Article 138 the general conduct. The principles of UN and international law are applicable, and that those should be followed to maintain the peace, security and to promote international cooperation and mutual understanding.<sup>158</sup> It is also received 158 signatures and 168 parties to the agreement,<sup>159</sup> thus, it could be argued that it has quite strong standing in international law.

Benefit of mankind principle is laid out in Article 140, and it shares the similar structure as the same one in the MA. All the activities are to be carried out in benefit of mankind, regardless of geographical location or specifically economic and social prominence of the states.<sup>160</sup>

### 3.2.1. Applicability of principles to Law of Space

Law of the Seas and treaties concerning Antarctica could be applicable, when researching outer space.<sup>161</sup> While completely different bodies, they all share the same geographical and geopolitical vagueness, also, they are in shared use.<sup>162</sup> We have also passed laws that limit the sovereign use and appropriation of seas and Antarctica, to benefit all humankind.<sup>163</sup> It is argued that Outer Space and Antarctica both are either *terra communis* or *terra nullius*, province of humankind or province owned by no one.<sup>164</sup> As presented in this thesis, LOS, Antarctica treaty and laws regulating activities in outer space share the same legal principles.<sup>165</sup>

While common heritage of mankind principle varies in ways of interpretation, it is still argued to primarily hold certain elements in all of these treaties.<sup>166</sup> In order for common heritage principle to be widely applicable, it needs to take in consideration developing countries and developed nations interests, and must address both ways of interpretations.<sup>167</sup>

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<sup>158</sup> LOS Article 138

<sup>159</sup> United Nations Treaty Collection, Status of United Nations Convention on the Law of the Sea, entry into force 16 November 1994 Retrieved from: [https://treaties.un.org/pages/ViewDetailsIII.aspx?src=TREATY&mtdsg\\_no=XXI-6&chapter=21&Temp=mtdsg3&clang=en#1](https://treaties.un.org/pages/ViewDetailsIII.aspx?src=TREATY&mtdsg_no=XXI-6&chapter=21&Temp=mtdsg3&clang=en#1)

<sup>160</sup> LOS Article 140

<sup>161</sup> Collis, C. (2017). Territories beyond possession? Antarctica and Outer Space. *The Polar Journal*, 7(2), 287–302

<sup>162</sup> *Ibid.*

<sup>163</sup> LOS Article 137 and Antarctica Treaty Article IV

<sup>164</sup> Collis (2017), *Supra nota* 161

<sup>165</sup> Common heritage of mankind, Non-Appropriation, Peaceful Use

<sup>166</sup> Frakes, J. (2003). The Common Heritage of Mankind Principle and Deep Seabed, Outer Space, and Antarctica: Will Developed and Developing Nations Reach Compromise. *Wisconsin International Law Journal*, 21(2), 409-434 p.410-415

<sup>167</sup> *Ibid.* p.415

## CONCLUSION

Balancing out international treaties and laws that regulate outer space operations, which have been written over 50 years ago, between national legislations that have emerged in the past decade can be challenging. In 1967, when the first treaty regarding outer space was drafted, commercial mining in outer space led by governmental organizations was merely a movie idea, not to mention private entities. Asteroids, that contain billions of euros worth of raw materials such as nickel, iron and cobalt fly by Earth.<sup>168</sup> And that's just one asteroid out of endless amounts in our solar system. Without dependable legal framework, mining operations in space are clouded by shroud of uncertainty. What makes the matters even more difficult, is the scarcity of countries that have possibility to carry out aforementioned operations.

Legality of these operations arguably depend on the interpretation of non-appropriation principle. Does the non-appropriation principle include resources gathered from celestial body. United States of America and Luxembourg have established in their respective national legislations that non-governmental organizations can circumvent non-appropriation principle, and that it is not applicable to resources gathered from asteroids and other celestial bodies.<sup>169</sup> Opposition however, is adamant that OST article 2 applies to, by definition, to mined resources. Uncertainty is clear and this author thinks that law should not come down only to interpretation of an article in matters where international armed conflict is a possibility. Problem regarding interpretation of Article 2 OST was addressed in the MA, where non-appropriation principle is extended explicitly to natural resources. However, advanced nations are seemingly reluctant to ratify this agreement. The provisions of the MA and OST are similar, but MA defines the contradictory articles of the OST, yet it is not considered to be binding international law due to lack of signatures the treaty has. This thesis proposes a solution to this particular problem by acknowledging the similar principles of the international agreements that regulate shared legal bodies such as Antarctica, The High Seas, and promote the prevalent principles to *ius cogens*. Principles of non-appropriation and common heritage of mankind are widely accepted through international community in these treaties.

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<sup>168</sup> Turner, B. (2021, December 3). 'Potentially hazardous' asteroid worth nearly \$5 billion will skim past Earth this week, NASA says. LiveScience. Retrieved from: <https://www.livescience.com/nereus-asteroid-to-pass-by-earth> 13 December 2021

<sup>169</sup> *Supra nota* 19 & 20

The Antarctica treaty system and Convention on Law of the Seas have already dealt with shared bodies that abide mankind principle. Although not fully applicable, some of the principles governing these treaties could be argued to apply into outer space as international binding customary law. Both of these treaties have wide acceptance through international community and years of obedience. Prevention of national appropriation in Antarctica and High Seas has protected the fragile ecosystems and prevented armed conflicts. If international law keeps pushing nations towards result sharing and multi-national exploration groups, this can lead international community towards scientific advancements that benefit the humankind, thus contributing towards the meaningful interpretation of the principle. Deep seabed has abundance of resources such as gold, aluminium, nickel and mangan etc. Antarctica has potential riches underneath the ice. In legal context, principles that protect these resources for the benefit of the humankind, could be argued to be applicable via principles governing outer space. In LOS and Antarctica Treaty, non-appropriation has been extended to resources, unlike in OST.

If the heritage of mankind-, non-appropriation- and international cooperation principles would be viewed as *ius cogens* and these principles added to interpretation of principles in OST, outer space operations by private entities would not be permitted as they are. However, as pointed out in this thesis, this author argues that it would benefit the whole humankind to transfer mining operations into outer space. A possible proposition would be that these principles should hold until international community and international organizations, with open dialogue with private entities, could come into terms on how operations such as mining in outer space would be conducted with regards to benefit sharing across all nations. By having broader interpretation of these principles, developing and smaller nations would also be taken into consideration better, than current situation offers. If outer space would truly be viewed as global commons, all of its riches could potentially be shared and problems such as lack of water and poverty could potentially be resolved.

Even global warming and it's byproducts such as climate change, environmental destruction caused by mining, pollution of air and water and loss of biodiversity could be arguably solved by mining operations in outer space. If we could stop the on-Earth mining operations and move industry to space, we could possibly combat present and future problems in environmental and socio-economical sectors.

E.Reinstein proposed an idea of international body, working with private entities directly as regulative authority in matters of mining operations in space.<sup>170</sup> We do need private initiative and innovation in order to make these operations happen. Also, if international law steers outer space operations into the direction of joint operations between international organizations and private entities, the needs of corporations would also be taken into account. Further research on the subject of joint operations between international organizations and private entities, on the economical and legal sectors regarding mining in outer space could provide useful insight when inspecting prospect of commercial operations and colonisation of outer space.

It appears difficult to balance capitalistic needs of private companies and benefit sharing towards developing countries. The private innovation and investment towards outer space should provide benefit towards respective parties, however, total monopoly of few countries and companies should also be avoided. When mining operations are starting to emerge, the mined resources will eventually dilute the market value of the same ones on-Earth. This author argues that these market mechanisms could arguably be contained with adequate international controlling entities over outer space mining and with proper international communication channels between private entities and international organizations.

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<sup>170</sup> Reinstein (1999), *Supra nota* 106

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