Commercial Space Mining: National Legislation vs. International Space Law

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Abstract

The exploration of space originally gained impetus due to scientific interest and later owing to political and military strategies of the super powers. Today, not only United States of America and Russia, but many developing economies are interested in outer space. The economic considerations of undertaking mining in space is obvious given the abundance of resources available on the Moon, on Mars and the asteroids. Extra-terrestrial mining could cut down the costs of space travel and also provide material resources necessary for life on Earth. Private companies across the globe are investing in the exploration of space, leading to countries such as America and Luxembourg passing national legislation legalising the activities of these corporations and allowing them to appropriate to themselves the resources mined through their operations, without granting ownership of celestial bodies thereby complying with the Outer Space Treaty. This paper seeks to analyse the policy and legal implications of undertaking mining in space by commercial entities. The paper contemplates the possibility of conflict between the general principles of international space law contained in the five treaties with national legislations passed by USA and Luxembourg and more recently, the United Arab Emirates. A more unified approach by the international community on the subject of space mining is suggested which would harmonise the interests of the states as well as commercial players. The aim of this paper is to identify the legal and policy challenges in space mining and suggest a harmonised international framework which would benefit both corporations and states.

1. Introduction

Commercialisation of outer space is not a new phenomenon, with national governments as well as private companies using communication satellites

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launched into space.[1] However, attaching property rights to these satellites along with its combined right to use spectrum, cannot be equated to the subject of discussion in the current paper – mining of resources from outer space.

It is well established with the passing of the Outer Space Treaty that outer space is the 'province of all mankind'.[2] However, in reality accessing outer space is a reality only to a privileged few, be it governments or private entities. Even assuming that excavation of natural resources is feasible with the current technology, due to the high cost of travelling to space combined with even higher costs of extraction of resources, space mining remains an activity of interest only to few adventurous entrepreneurs or states.

The crisis with non-renewable sources on Earth and the rate at which they are being exploited has led to the search for alternative resources to sustain life on Earth. While governmental agencies have been a forerunner in the field of space activities until this decade; with the introduction of the prospect of space mining, private corporations are eager for a bite of the pie.

In layman terms, currently mining in space is up for grabs on a 'first come first served' basis. Now, many countries may find this prejudicial, especially if they lack the ability to engage in space activities. Thus, harmonization of interest of nations and consensus on the path forward is the need of the hour.

The spectrum of space law philosophies forms a wide spectrum raging from the view that everything in space belongs to everyone, thereby requiring express permission for use or the contrasting view that anybody can take anything from space as long as they reach it first. This kind of analysis would definitely be objectionable, let alone naïve due to the very fact that international law does not give us enough guidance to choose one view over the other.

The legal discussion on space mining, though has been in existence for some time, is futile without the development of technology to extract the resources from space in an efficient and cost effective manner.[3] With increasing number of companies investing in research on exploration[4] and events such as the

1 Henry R. Hertzfeld, Frans von der Dunk, Bringing Space Law into the Commercial World: Property Rights without Sovereignty, Chicago Journal of International Law, v. 6, no.1 (2005) 81-99.

2 Article 1, The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies, of 27 January 1967, (610 U.N.T.S 205).

3 Paul Whitfield-Jones, One small step for property rights in outer space?, May 21, 2020, https://www.mayerbrown.com/en/perspectives-events/publications/2020/05/one-small-step-for-property-rights-in-outer-space(accessed 30.09.20).

4 Michael Sheetz, Space Companies raised a record $5.8 billion in private investments last year, Jan. 14, 2020, https://www.cnbc.com/2020/01/14/space-companies-including-spacex-raised-5point8-billion-in-2019.html (accessed on 28.08.20).

introduction of the Artemis Accords,[5] the discussion is more pertinent than ever before. This paper will discuss the legal framework or the lack of it in matters of commercial space mining. However, matter such as the technology and science of space mining is out of the scope of this paper.

2. Position of International Law on Space Mining

International treaties such as the Outer Space Treaty and the Moon Agreement lay down the basic principles governing outer space, which is further enunciated with the provisions of the Liability Convention, Rescue Agreement and the Registration Convention. The OST when drafted in 1967 possibly did not envision a scenario where private players engage in commercial space activities. The Moon Agreement does refer to the exploitation of resources on the Moon. However, the Treaty has not been ratified by most of the major spacefaring nations and further, the Treaty is limited in scope as it refers only to resources on the Moon. Since these treaties pertaining to space law make no direct reference to space mining, it is imperative that the provisions of these treaties must be analysed in order to gauge the legality of space mining.

2.1. Space as the province of all mankind

Article I of the OST pronounces the freedom of States to explore outer space and use its resources for the benefit of and in the interest of all nations.

The obligation laid down in Article I of the OST is further elaborated in the UN Declaration on the Exploration and Use of Outer Space.[6] It shall be carried out for the benefit and in the interests of all States, irrespective of their degree of economic, social or scientific and technological development, and shall be the province of all mankind. Particular account should be taken of the needs of developing countries.[7]

Though it is a settled position in international space law that outer space is the 'province of all mankind', when it comes to the aspect of mining in space, there are but contrasting views displayed by different States. As companies are embarking on this journey as private players and with an entrepreneurial spirit, the legality of such operations definitely requires some merit.

It is contested whether the exploration and 'use' of outer space covers activities such as asteroid mining. In the absence of specific mention of

5 The Artemis Accords, Principles for a Safe, Peaceful and Prosperous Future, https://www.nasa.gov/specials/artemis-accords/index.html (accessed on 30.09.20).

6 Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interests of all States, Taking into Particular Account the Needs of Developing Countries, 1996, UN GA/RES/ 51/122.

7 S. B. Rosenfield, "'Use' in Economic Development of Outer Space", 24th Proceedings of the colloquium on the Law of Outer Space, Rome, Italy, 1981, 73–77.

commercial space mining in any of the existing treaties, reliance has to be placed on other sources such as the *travaux préparatoires* of the OST to argue that it does include such activity.[8]

The freedom to use space flows from the absence of recognised territorial sovereignty by any state. However, the OST does not make a reference to the rights which are enumerated under the 'freedom of exploration and use'. Reliance can be placed on a similar situation in the freedom of use in the high seas and the rights granted to States under UNCLOS. It can be noted that states are granted various rights in the high seas including the commercial right to fishing.[9] Thus, it can be argued that there is recognition of granting commercial rights in international law even where states lack sovereignty.[10] Furthermore, particular to space law, states have long been granted the rights to use frequencies and establish satellites in space for commercial purposes. Therefore, it can be observed that commercial use of space is not against the principles of international space law.

2.2. Principle of Non-appropriation

Article II of the OST expressly states that the Moon and other celestial bodies are not subject to appropriation by States. It further declares that no State can claim sovereignty over space objects either by use, occupation or other means.

The Moon Agreement is more stringent than the OST and the moon along with its natural resources would not be subject to appropriation by any State or non-governmental entity inter alia.[11] Jeremy Zell, in his paper, suggests an interpretation of the Moon Agreement which would permit mining activities on the condition that they are regulated by an International Authority.[12] However, owing to the limited applicability of the Agreement to only the Moon and limited acceptance by international community,[13] this cannot be considered as the yardstick with which legality of mining in other celestial bodies be measured. Since the states which have passed national legislations

8 Article 87, United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397.

9 IISL Directorate of Studies, Background Paper, Does International Space Law either permit or prohibit the taking of resources in Outer Space and on Celestial Bodies, and how is this relevant for national actors?, 2016.

10 Article 11, Agreement Governing the Activities of States on the Moon and Other Celestial Bodies within the Solar System other than the Earth, December 18, 1979.

11 Louis de Gouyon Matignon, The 1979 Moon Agreement, July 17, 2019, https://www.spacelegalissues.com/the-1979-moon-agreement/ (accessed 28.09.20).

12 Jeremy L. Zell, Putting a Mine on the Moon: Creating an International Authority to Regulate Mining Rights in Outer Space, Minnesota Journal of International Law, 2006.

13 Kriti Gautam Bhattacharya, The Viability of Space Mining in the Current Legal Regime, Astropolitics, 16:3, (2018) 216-229.

discussed in this paper are not signatories to this Treaty, the author has not entirely discussed the implications of space mining through the lens of the Moon Agreement. It is however acknowledged that the Moon Agreement could be a hindrance when mining of resources from the Moon are considered.

The principle of non-appropriation can still be upheld under the OST even with states proceeding towards commercial mining. As long as States do not exercise sovereignty over these bodies, they are not in violation of any international principles. The real issue is with respect to the matter or objects that are appropriated from outer space. National laws as discussed below have thus sought to grant people rights over these resources extracted from celestial bodies.

3. National Legislations and their Impact on Space Mining

Article VI of the Outer Space Treaty obligates States to supervise the activities of the private players, which has thus led to the emerging need for national legislation on this aspect.[14] This obligation of authorization and continuing supervision by the States of all activities of Non-governmental entities in Outer Space, has not been put into practice by almost every state who has ratified the Treaty. However, as a step towards regulating space mining, it is expected of States to first establish a national framework which will enable the state to supervise activities of private participants in space along with meeting their obligations under the OST.[15]

The UN COPUOS Meeting in 2018 included deliberations by States on the potential legal models for activities in exploration, exploitation and use of space resources. While many countries made statements regarding their interest in space resources, some countries sought to restrict commercial activity until an international legal framework was developed. Furthermore, countries such as USA and Luxembourg indicated their intention to develop a national legal framework to govern commercial space activities.

Collaboration between States will also prove to be an accelerator in undertaking commercial space operations. Luxembourg and UAE have already signed a MoU to this end.[16] Similarly UAE collaborated with Japan in launching their Mars Mission and many such examples can be cited.

14 IISL Directorate of Studies, Background Paper, Does International Space Law either permit or prohibit the taking of resources in Outer Space and on Celestial Bodies, and how is this relevant for national actors?, 2016.

15 Luxembourg and the United Arab Emirates Sign MOU on Space Resources, www.spaceresources.lu, 10 October 2017, https://spaceresources.public.lu/en/actualites/2017/MoU-UAE.html, (accessed on 27.09.20).

16 §51303. Asteroid resource and space resource rights, Space Resource Exploration and Utilization Act of 2015.

3.1. United States of America

The USA was the first state to pass a legislation attaching proprietary rights to resources in Space mined by American citizens or companies. The operative provision of the legislation states- "A United States citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States."[17]

Though the United States legislation grants rights over space resources as noted above, it does not claim sovereignty or ownership of any celestial body. This definitely is a key factor in distinguishing between the concept of ownership of resources in space as opposed to exclusivity over celestial bodies or space itself.

Though there have been oppositions to the enactment of such a legislation by United States, it has served as a gateway to commercial exploration of space and has been followed by countries like Luxembourg and United Arab Emirates.

More recently, NASA – the space agency of the US – has announced the Artemis Accords to promote the international community in reaching a consensus on the space resource activities. The underlying principles of the Accords are safety and transparency. One of the principles declare that extraction and utilization of space resources will be within the boundaries of OST.[18] The Accords are based on presumption of legality of space resource exploitation and urges other States to cooperate with each other by accepting this basic principle.

3.2. Luxembourg

Though the US and the Luxembourg legislation both provide mining companies with the right to undertake mining as well as own, use and sell these resources; the Luxembourg government intends to attract investment into the country and encourage its people to invest in space, which is why an additional condition that the company's major stakeholder be based in the country is imposed in the law.[19]

The Space Law excludes from its application, satellite communications, orbital positions or the use of frequency bands.[20] The authorisation granted under this Act will be exclusively for a mission of exploration and use of space resources for commercial purposes.[21]

17 Sec. 403, Space Resource Exploration and Utilization Act of 2015.
18 The Artemis Accords, Principles for a Safe, Peaceful and Prosperous Future, https://www.nasa.gov/specials/artemis-accords/index.html (accessed on 30.09.20).
19 Article 5, Law of July 20th 2017 on the Exploration and Use of Space Resources.
20 Article 2(4), Law of July 20th 2017 on the Exploration and Use of Space Resources.
21 Article 2(4), Law of July 20th 2017 on the Exploration and Use of Space Resources.

The law also lays down clear criteria for a company to obtain authorization under the Act and imposes obligations such as risk assessment, audit, sound and prudent operation of the entity, disclosure of identity of 10% of shareholders, professional experience of persons managing the operation etc.[22]

Luxembourg has collaborated with companies such as Planetary Resources and Deep Space Industries to develop and test technologies for the exploitation of resources in Space.[23]

3.3. United Arab Emirates

The UAE having been successful in the exploration of oil, is now moving towards making its mark in human space exploration as well as space mining.[24] To this end, it has taken various steps, the most recent being the Mars Mission launched in July 2020.[25]

The UAE National Space Law is a comprehensive and futuristic legislation which puts in place a regulatory framework for commercial space mining. The Emirates Space Agency is established as an independent legal entity which will provide permits for space activities in consultation with the Council of Ministers.[26] The Regulated activities mentioned in the law include space resource exploration or extraction activities for scientific, commercial or other purposes.[27]

The UAE Space Policy[28] envisages the growth of the commercial space industry and seeks to provide an attractive regulatory environment for global companies in this sector.

Both UAE and Luxembourg have proven that the size of the country does not matter in advancing space exploration. The UAE Law is drafted in such a comprehensive manner that even immediate space exploration activity can be conducted on the basis of this law. It definitely has led the path in the Middle

22 Article 7 to 11, Law of July 20th 2017 on the Exploration and Use of Space Resources.

23 Vasudev Mukunth, Fiat Luxembourg: How a Tiny European Nation is Leading the Evolution of Space Law, July 15, 2017, https://thewire.in/157687/luxembourg-spaceasteroid-mining-dsi/ (accessed 25.09.2020).

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

25 Kareem Shaheen, First Mars Mission from UAE aims to inspire a new generation of space scientists, July 20, 2020, https://www.nationalgeographic.com/science/2020/07/uae-mars-mission-hope-aims-inspire-new-generation-space-scientists/ (accessed on 28.09.2020).

26 Article 14, Federal Law no. 12 of 2019 on the Regulation of the Space Sector.

27 Article 14, Federal Law no. 12 of 2019 on the Regulation of the Space Sector.

28 Para 3.2, UAE Space Policy.

East to provide impetus to space activities which will enhance the future of mankind.

4. Potential issues in commercial space mining

This paper has focused on the current national and international legal framework for commercial space mining. Nevertheless, it is observed that space mining encompasses a range of other issues which are not dealt with in detail in this paper. A few of such issues which can occur post launch of the first successful project to extract resources from asteroids, are mentioned below.

4.1. Space debris and Environmental Issues

Commercial exploration of resources on Earth has proved to us that the waste generated from mining activities can be harmful if not treated adequately. Mining on earth has resulted in environmental degradation,[29] but there is a lack of evidence on the impact of space mining in space as well as on Earth. In space, there is the issue of harmful effects of mining as well as the collection of space debris which in turn could be harmful for future space operations.[30] Hence, this is a potential risk that entities venturing into space have to bear in mind. Upon commencement of extraction of resources from asteroids or other celestial bodies, the international body of law must consider these issues as well.

4.2. Use of Artificial Intelligence for Extraction

With the impact of Artificial Intelligence felt in every walk of life, space exploration doesn't remain far behind. Most technologies being developed currently for the extraction of and return of space resources are employing some form of artificial intelligence and some tasks are carried out entirely by robots,[31] which brings us to the question of legality and responsibility for such actions. The attribution of liability to acts carried out by robots is another problem which remains to be tackled.

4.3. Ethical conduct by companies

Another factor to be explored is the consequence of vesting rights in common resources to private entities who are motivated only by profits. A lack of

29 Haddaway, N.R., Cooke, S.J., Lesser, P. et al. Evidence of the impacts of metal mining and the effectiveness of mining mitigation measures on social–ecological systems in Arctic and boreal regions: a systematic map protocol. Environ Evid **8,** 9 (2019).

30 Danger: Orbital Debris, May 04, 2018, https://aerospace.org/article/danger-orbital-debris (accessed 30.09.2020).

31 Gary Fowler, AI's Role in Space Exploration, July 20 2020, https://www.forbes.com/sites/forbesbusinessdevelopmentcouncil/2020/07/20/ais-role-in-space-exploration/#5f8c705d7206.

respect towards the international legal principles might cause conflict between states which would disrupt peaceful operations.

5. Conclusion

With the conflicting arguments for and against commercial space mining, it can be concluded that academic debate on this issue is ongoing unless an end is put to it with a definite legal international framework. In furtherance of this, the researches makes the following suggestions.

5.1. Proposal for an International Framework

The researcher suggests that an intergovernmental organisation must be established to deal with all aspects of space law and specifically with respect to mining in space.[32]

In proposing the skeleton of such an international framework, a parallel can be drawn to the International Seabed Authority, which governs the exploitation of resources by providing a license on such mining.[33]

It flows from the wording of Article VI of the OST that the 'use and exploration of space' referred to in Article I is not limited only to States but is free for non-governmental entities as well subject to the restrictions in the treaty.

There have been proposals for an International Authority to act as regulator granting permits to space faring entities and a mechanism of sharing such benefits. The International Authority can prove to be an organised and effective method of regulation, provided that there is a consensus between states. Given the non-compulsory nature of international obligations, States have to negotiate the terms of such an organization.

The author is of the view that the common heritage concept cannot be strictly construed so as to restrict countries more technologically advanced from undertaking space activities. This would act as a deterrent to countries or firms who invest large sums of money in undertaking space operations. This would definitely not imply that non-spacefaring nations should have no say at all.

Royalties must be imposed on governmental or private entities who undertake an activity such as outer space mining. The royalties collected from such licenses granted by the Intergovernmental Organisation should be used for purposes which benefit all nations as laid down from time to time.

Furthermore, the International organisation set up should also carry out other activities such as settlement of disputes either through arbitration or

32 Kamil Muzyka, The Problems with an International Legal Framework for Asteroid Mining, Space Law Resource, April 1, 2017.

33 Article 136, United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397.

otherwise. The authority should also be responsible for maintenance of records and thus, have an international register for entities who wish to undertake missions for commercial space mining. This register should also note the details of the objects mined and complete details of the operation.

Another suggestion is that there be transparency in the working of the organisation and all states must be given access to the international register, thus tracking down activities of private entities which would be in line with the common heritage concept.

Though the author argues that extraction of resources from celestial bodies can be undertaken under the auspices of the OST, it is also pertinent to note that the commencement of commercial activity cannot be based on the national legislations alone and must be regulated by the International Organisation as proposed.

The national legislations will provide a regulatory framework within the country to ensure compliance with international legal principles and impose liability on private players for any violation of recognised space law principles. Hence, the national and international legal framework has to go hand in hand if we are to even come close to bringing much needed clarity on this subject.