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An International Legal Regime for Lunar Mining and India's way forward

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Mankind's technological advances have meant that resources that exist outside of our planet are now within our reach. These resources, like Helium-3 on the Moon, are going to be extremely crucial in helping solve many major problems the world is facing right now, including climate change, and hence there is a pressing need to access and utilise them. However, if the same is done in a haphazard way, it may cause more harm than good, including potential side effects like environmental pollution both in outer space and within our own planet, and an increase in income inequality among the people. Hence, there is a need to regulate the activities of various actors in space, while also providing incentives to take the enormous risks that come with these activities. The existing international legislation that deals with Outer Space is simply not enough to deal with these issues, and are a victim of the times they were created in, including the Outer Space Treaty. This means that it is necessary to have a relook into these treaties and update them as necessary. This may include creating international agencies that have the requisite jurisdiction to regulate activities in space, and while creating these agencies, the experience of pre-existing terrestrial agencies that deal with similar problems may be invaluable. This paper will also look at the Indian situation with regard to legislation regulating space activities, and finding that no over-arching legislation exists as of today, makes some suggestions that can be incorporated within any future legislation that can deal with space resource extraction activities.

Keywords: *outer space, resource extraction, moon, outer space treaty.*

INTRODUCTION

Ever since Mankind first ventured into outer space, it has dreamt of escaping the constraints that remaining on Earth places on us. The foremost among these constraints is the growing need for resources for the people that our planet is simply unable to match. This can be considered to be the root problem of most of the conflicts that plague us today, and humanity desperately needs newer sources of energy and resources that it can exploit for its growth. In this regard, technology has progressed far enough that the utilisation of resources in space is now within the realm of possibilities rather than science fiction. The utilisation of these resources is crucial to allow for sustainable exploration of nearby celestial bodies like the moon and various planets of our Solar System, like Mars and Venus, and will also be invaluable in finding solutions to various global challenges, all the while creating economic returns for different industries.¹ Furthermore, the ability and ambition showcased by private actors like SpaceX and Moon Express towards activities in outer space earlier thought to be limited only to State actors brings in a further layer of complexity in human activities in space.²

One of the planned space projects that may soon become a reality is lunar mining, and the fact that the Moon is considered to have large deposits of Helium-3 (“He-3”), an isotope of helium that is rarely found on Earth and is theoretically an ideal fuel for thermonuclear fusion power reactors, means that such activities could be potentially very important to solve the world’s energy crisis and, at the same time, be very lucrative.³ This means that there is a pressing need to re-examine the existing regulations of international law that deal with activities of various actors in outer space, specifically the Moon, and the legality of extraction and ownership of any resources found there, to ensure that any possibility of a space “gold rush” is avoided while simultaneously encouraging investment into these extremely crucial projects.

¹ 'ESA Space Resource Strategy' (*European Space Agency*, 2019)

<https://sci.esa.int/documents/34161/35992/1567260390250-ESA_Space_Resources_Strategy.pdf> accessed on 23 January 2022

² Kurt Taylor, 'Fictions of the Final Frontier: Why the United States Space Act of 2015 is Illegal' (2019) 33 (4) *Emory International Law Rev* 653

³ Richard B. Bilder, 'A Legal Regime for the Mining of Helium-3 on the Moon: U.S. Policy Options' (2010) 33 (2) *Fordham International Law Journal* 243

INTERNATIONAL TREATIES

While space exploration is a relatively new activity, its significance has meant that there are multiple international treaties that seek to regulate activities in space, the most important of which is the 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” or “OST”), negotiated in 1967. The Outer Space Treaty sometimes referred to as the “constitution of Outer Space”, is the primary document that establishes fundamental rules about State’s activities in space.⁴ It has been ratified by 111 States⁵, including all major space powers. Articles I and II of this treaty are especially significant when it comes to the question of property rights in outer space. Article I provides that “outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States” and States should explore “for the benefit and in the interest of all countries.”⁶ Article II provides 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.”⁷ This is generally referred to as the principle of non-appropriation and has been subjected to varying interpretations by different actors at different times. The origin of the Outer Space Treaty during the period of the Cold War along with the technological limitations of the time led to the original broad interpretation associated with the non-appropriation principle⁸, but the same has been subject to later changes.

⁴ Jill Stuart, ‘The Outer Space Treaty has been remarkably successful – but is it fit for the modern age?’ (*The Conversation*, 27 January 2017) <<https://theconversation.com/the-outer-space-treaty-has-been-remarkably-successful-but-is-it-fit-for-the-modern-age-71381>> accessed 23 January 2022

⁵ Committee on the Peaceful use of Outer Space, *Status of International Agreements relating to activities in outer space* (16) <https://www.unoosa.org/res/oosadoc/data/documents/2021/aac_105c_22021crp/aac_105c_22021crp_10_0.html/AC105_C2_2021_CRP10E.pdf> accessed 23 January 2022

⁶ Treaty on Principle Governing the Activities of States in the Exploration and Use of Outer Space, 1967, art. 1

⁷ Treaty on Principle Governing the Activities of States in the Exploration and Use of Outer Space, 1967, art. 2

⁸ Joanne Irene Gabrynowicz, ‘Space Law: Its Cold War Origins and Challenges in the Era of Globalization’ (2004) 37 (4) *Suffolk U. L. Rev.* 1041

THE MOON AGREEMENT

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (“The Moon Agreement”), which came into existence in 1984 has been widely seen as a failed treaty, due to the lack of any meaningful participation by space-faring nations.⁹ Hence, this treaty fails to create any binding obligation on these nations, but can still be considered to be useful for determining future legislation on this subject. The major reason that the Moon Agreement failed to garner the requisite support is that under its Articles, celestial resources are considered to be “the common heritage of mankind”, thereby adopting an international law common heritage approach to outer space.¹⁰ This common heritage approach to international space law rests on five tenets:

- There is an absolute bar on both private and state appropriation of celestial resources in outer space;
- Celestial resources are for the benefit of all states and every state should manage and care for them;
- Since celestial resources are for the benefit of all states, any benefit a state attains must be shared with all other states;
- Outer space may not be used for military purposes; and
- Outer space must be preserved by states for future generations.¹¹

While developing countries were supportive of the “common heritage” principle, the fact that no space-faring nation has so far ratified it has led to this treaty having little to no effect in creating obligations on the States and other actors who have the ability to conduct lunar mining operations in the near future.

⁹ Michael Listner, ‘The Moon Treaty: Failed International Law or Waiting in the Shadows?’ (*The Space Review*, 24 October 2011) <<https://www.thespacereview.com/article/1954/1>> accessed 21 January 2022

¹⁰ Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 1979

¹¹ Kurt Taylor (n. 2)

DEVELOPMENTS IN SPACE LAW AND PRACTICE

The years since the drafting of the Outer Space Treaty have seen a sea of change in how the Articles under it have been interpreted, caused mainly due to advancement in technology and changing circumstances that have allowed previously unreachable goals to become possible. The Outer Space treaty was drafted in a Cold War background, and the fear amongst the international community that allowing the two major space powers, the US and the USSR, to gain legal rights to appropriate space or celestial bodies could mean a new level of nuclear threat emanating from these regions.¹² These countries also had incentives to keep space free and open to allow for intelligence gathering using satellites.¹³ Hence at the time of the drafting of the Outer Space Treaty, there was an underlying intention to prevent any appropriation whatsoever, and this would have failed if the treaty had not been applied broadly.

However, as time has passed since the drafting of the Outer Space Treaty, many activities of space-faring nations that may have been considered illegal have gone unchallenged, creating a new legal framework for them to function on, and arguably entering the field of customary international law.¹⁴ These activities include NASA bringing back lunar material with their manned moon missions, and declaring them to be “US Government Property”. Some of these moon rocks have been used for scientific experiments and some have been sent to museums. Some months after the end of the Apollo 11 mission, the US even sent tiny lunar samples to various countries as “diplomatic gifts”. Most of the other sample moon rocks that NASA considers to be legally their property remain at a laboratory at the Johnson Space Centre in Houston, from where they are occasionally loaned out to museums for public display and to scientists for research purposes.¹⁵ These actions clearly show that the US considers the moonrocks to be their property, irrespective of what the Outer Space Treaty can be interpreted as, and a lack of challenge to this position implies that this position has gained the position of

¹² Joanne Irene Gabrynowicz (n 8)

¹³ Thomas Gangale, *The Development of Outer Space: Sovereignty and Property Rights in International Space Law* (ABC CLIO 2009) 11

¹⁴ Abigail D Pershing, 'Interpreting the Outer Space Treaty's Non-Appropriation Principle: Customary International Law from 1967 to Today' (2019) 44 (1) *Yale Journal of International Law* 149

¹⁵ Meghan Bartels, 'The Moon on Earth: Where Are NASA's Apollo Lunar Rocks Now?' (*Space.com*, 14 July 2019) <<https://www.space.com/where-are-nasa-apollo-moon-rocks.html>> accessed 22 January 2022

customary international law. Even the US' greatest competitor, the USSR has brought back lunar samples and claimed them to be their own property. Some of these have also been sold to private citizens legally, further entrenching the position that it is legal under International Law to own space resources.¹⁶

IMPORTANT LEGISLATIVE AND POLICY CHANGES

The shift in customary international law is further evidenced by the various domestic legislation of countries and the policies that they have espoused in regard to mining activities in space, all the while continuing under the aegis of the Outer Space Treaty.

The United States:

In 2015, the US passed the Spurring Private Aerospace Competitiveness and Entrepreneurship (SPACE) Act in 2015 in the US, which provides that "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 The SPACE Act is the first instance of a government recognising the trend of private companies' commercial rights to space resources under law. This clearly shows that the US fundamentally believes that appropriation of space resources, including from the Moon, is legal under the Outer Space Treaty, with the only restriction being "national appropriation by claim of sovereignty."

Most recently, the US-led release of the Artemis Accords has been an important development in this matter. The Accords are intended to create a framework that the US and its partners in the Artemis Programme (which aims to send astronauts to the moon by 2024) can agree upon

¹⁶ Thomas Gangale & Marilyn Dudley-Rowley, 'To Build Bifrost: Developing Space Property Rights and Infrastructure' (*Research Gate*, August 2005) <https://www.researchgate.net/publication/237676725_To_Build_Bifrost_Developing_Space_Property_Rights_and_Infrastructure> accessed 22 January 2022

¹⁷ Competitiveness and Entrepreneurship Act, 2015

to clarify some of the lacunae in the Outer Space Treaty.¹⁸ However, this unilateral action has not gone unchallenged, with Russia already criticising it as an effort to sideline the UN.¹⁹ While at first glance, it may seem that the Artemis Accords merely confirm pre-existing treaties that deal with Outer Space, there are some controversial provisions that have been included that deal with extraction and use of space resources and the establishment of “safety zones”. The former confirms the US’s position with regard to the Outer Space Treaty as seen in their domestic legislation that “space resource extraction and utilization can and will be conducted under the auspices of the Outer Space Treaty.”²⁰ Other countries that sign the Accords show their assent to this interpretation, and hence, eventually, the same may become part of customary international law. The other controversial part of the Accords is the establishment of “safety zones” around lunar bases, ostensibly to avoid harmful interference with the activities conducted in those bases. Though American officials maintain that these zones are not a territorial claim of the affected areas, it can be argued that such zones have at least some characteristic of territorial sovereignty,²¹ and hence may run afoul of the Outer Space Treaty.

In order to further push the position of international law in their favour, NASA on September 10th, 2020, released a “solicitation for commercial companies to provide proposals for collecting of space resources”.²² In this, NASA requires a company to collect a small amount of Moon “dirt” or rocks from any location on the lunar surface, provide imagery to NASA of the collection material along with relevant data regarding location, and then conduct an “in-place” transfer of this material to NASA, after which the collected material becomes “the sole

¹⁸ Loren Grush, ‘NASA announces international Artemis Accords to standardize how to explore the Moon’ (*The Verge*, 15 May 2020) <<https://www.theverge.com/2020/5/15/21259946/nasa-artemis-accords-lunar-exploration-moon-outer-space-treaty>> accessed 22 January 2022

¹⁹ *Ibid*

²⁰ ‘The Artemis Accords’ (NASA) <<https://www.nasa.gov/specials/artemis-accords/index.html>> accessed 23 January 2022

²¹ Anel Ferreira-Snyman, ‘Challenges to the Prohibition on Sovereignty in Outer Space - A New Frontier for Space Governance’ (2021) 24 (1) Potchefstroom Electronic Law Journal 1

²² Jim Bridenstine, ‘Space Resources are the Key to Safe and Sustainable Lunar Exploration’ (*NASA Blogs*, 10 September 2020) <<https://blogs.nasa.gov/bridenstine/2020/09/10/space-resources-are-the-key-to-safe-and-sustainable-lunar-exploration/>> accessed 23 January 2022

property of NASA” for their use.²³ On December 3rd, 2020, NASA released a press statement regarding the selection of companies for this role.²⁴ It has been argued that the main aim behind this move is to set a new legal precedent for mining on the lunar surface that NASA can then use to further their own space mining programs.

European Union:

The ESA Space Resources Strategy, released in May 2019, covers the period until 2030 and presents a “strategic approach to the space resources opportunity”.²⁵ While it provides that it would be the duty of the ESA’s Member states to take an active role in deciding the legal, regulatory, and policy framework, it has an underlying assumption that “there is no international consensus regarding the legality of space resources utilisation and exploitation under international law, nor are there international legal norms on the legal status of space resources or their governance.”²⁶ However, member states have started bringing in domestic legislation with the aim of encouraging space resource exploitation, like Luxembourg passing a law entitled “On the Exploration and Utilisation of Space Resources”²⁷ in 2017, with a goal to provide legal certainty to companies regarding ownership of space materials. This was followed by a law passed in December 2020 “On Space Activities”²⁸, which “offers a clear legal framework for the authorisation and supervision of space activities allowing the management of risks related to space activities and state liability”. This law applies to any space activity conducted within the jurisdiction of Luxembourg, irrespective of the nationality of the operator, and any activity conducted by a Luxembourg national or legal person, anywhere in the world.²⁹ Luxembourg, in collaboration with the ESA, also launched European Space

²³ *Ibid*

²⁴ ‘NASA Selects Companies to Collect Lunar Resources for Artemis Demonstrations’ (NASA, 3 December, 2020) <<https://www.nasa.gov/press-release/nasa-selects-companies-to-collect-lunar-resources-for-artemis-demonstrations>> accessed 23 January 2022

²⁵ ESA Space Resource Strategy (n 1)

²⁶ *Ibid*

²⁷ Jeff Foust, ‘Luxembourg adopts space resources law’ (*Space News*, 17 July 2017) <<https://spacenews.com/luxembourg-adopts-space-resources-law/>> accessed 23 January 2022

²⁸ Law of December 15th 2020 on Space Activities

²⁹ Bob Calmes, Laurent Schummer & Blazej Gladysz-Lehmann, ‘The Space Law Review: Luxembourg’ (*The Law Reviews*, 9 December 2021) <<https://thelawreviews.co.uk/title/the-space-law->

Resources Research Innovation Centre, “to create additional opportunities for European and international innovation. Its initial focus is on space resource extraction, processing, and manufacturing to advance sustainable space exploration.”

A POTENTIAL FUTURE LEGAL REGIME

The developments in State practice over the years show a clear right being carved out that allows States and private parties to own resources and materials found in space. However there still exists considerable discord on the question of whether the Outer Space Treaty, or even customary international law, permits activities such as space mining, and the enormous costs and risks involved in such activities mean that nobody will be willing to start such operations when they do not have assurances of profits.³⁰ As the importance of utilising space resources becomes clear and interest in undertaking such programs rises, from both state and private parties, it is necessary to revise the relevant international legislation and address the concerns of these actors, while also ensuring equitable use of space resources and that developing countries are not left out.

While it seems unnecessary and wasteful at the moment to completely remove the Outer Space Treaty and replace it with a new instrument, considering the fact that it enjoys widespread recognition that seems unlikely to come about for any new treaty that seeks to impose more onerous burdens on member States (as seen in the case of the Moon treaty), there is a need for an International Treaty that can outline the rights and obligations of various actors, both State and private, in performing mining activities in Outer Space. Such a treaty would need to deal with questions of property law and jurisdiction in space, and considering the fact that the Outer Space treaty prohibits national appropriation³¹, the best method would seem to be the setting up of some international organisation that can exercise jurisdiction in space. This potential treaty should ideally also set in place standards of safety that actors have to follow in

[review/luxembourg#:~:text=As%20a%20general%20rule%2C%20the,and%20\(2\)%20elsewhere%20by%20an>](#)
accessed 23 January 2022

³⁰ Andrew Linter, 'Extraterrestrial Extraction: The International Implications of the Space Resource Exploration and Utilization Act of 2015' (2016) 40 (2) Fletcher Forum World Affairs 139

³¹ Treaty on Principle Governing the Activities of States in the Exploration and Use of Outer Space, 1967, art. 2

space, questions of liability, and settlement of any disputes that may arise. Finally, to give effect to the principle behind the Outer Space Treaty to provide the benefits of space exploration to even non-space faring nations³², this treaty will need to provide for their needs and hopefully give them a meaningful voice in the decision-making process, while not removing the incentives for the more developed nations to take on such risky activities.

One of the possible ways to ensure the furtherance of commercial activities in space is the setting up of an international body that can regulate these activities. Such a body can be based upon already existing terrestrial bodies that deal with similar situations. Examples of such institutions include the Alaska Permanent Fund and the International Seabed Authority. The Alaska Permanent Fund is a universal cash-transfer program established through revenues on oil and gas leases.³³ As long as a person is eligible under the concerned Statute, he or she can receive an annual dividend that is calculated based on the number of eligible Alaskan applicants in a dividend year, and one-half of the statutory net income averaged over the five most recent fiscal years.³⁴ Such a structure can also be used to create a Space Fund in the future that could be funded by leasing out outer space resources and would be seen as consistent within the Outer Space Treaty requirements and also for the needs of private companies.³⁵

Another commonly cited example of a territorial mechanism that could be applied for Outer Space Resources is the one created under the United Nations Convention on the Law of Sea ("UNCLOS"). This model could possibly be the best option in so far as it relates to preserving non-space faring nations' rights with regard to outer space, considering the success UNCLOS has had in providing a voice to developing nations in the regulation of high seas and the seabed beyond national jurisdiction.³⁶ Comparisons with UNCLOS are justified as it also deals

³² Treaty on Principle Governing the Activities of States in the Exploration and Use of Outer Space, 1967, art. 1

³³ Dylan Matthews, 'The amazing true socialist miracle of the Alaska Permanent Fund' (*Vox*, 13 February 2018) <<https://www.vox.com/policy-and-politics/2018/2/13/16997188/alaska-basic-income-permanent-fund-oil-revenue-study>> accessed 24 January 2022

³⁴ Alaska Permanent Fund and Corporation, 2020, Title 37 Chapter 13

³⁵ Hunter Sutherland, 'The Stakes Are out of This World: How to Fix the Space Act of 2015' (2021) 22 (2) *Vt J Envtl L* 100

³⁶ Maurice Hope-Thompson, "The Third World and the Law of the Sea: The Attitude of the Group of 77 Toward the Continental Shelf", (1980) 1 (1) *B.C. Third World L.J.* 37

with resources, the high seas, which are not subject to national appropriation, like Outer Space. The International Seabed Authority, created under UNCLOS, is the main mechanism through which States and private companies can legally exploit ocean resources, including the deep seabed. Similarly, under the already existing UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS) an authority similar to the International Seabed Authority can be created which can then exercise jurisdiction over property rights in outer space, and the authority can decide on questions like what rents to be charged and how to use its funds.³⁷ It is important that such Authority have jurisdiction over property rights beyond mining rights in space to ensure that companies that want to proceed with space mining activities have the legal security required and so that it is future-proof with respect to questions of space tourism and space colonies that may arise later.

THE INDIAN PERSPECTIVE

India, being a spacefaring country, and having successfully completed missions to both the Moon³⁸ and Mars³⁹, has the opportunity to help guide the future of space law. However, it still lacks overarching legislation to regulate its own activities in space, as this is done through policies like the Satellite Communication Policy, 2000, and the Remote Sensing Data Policy, 2011.⁴⁰ While a Space Activities Bill⁴¹, based upon the Model Law on National Space Legislation formulated by the International Law Association and submitted to the UN Committee on Peaceful Use of Outer Space, was introduced in 2017, it has not been approved by the Cabinet as yet and, in its original form, focuses on encouraging non-

<<https://lawdigitalcommons.bc.edu/cgi/viewcontent.cgi?article=1422&context=twlj&httpsredir=1&referer>>

accessed 23 January 2022

³⁷Abigail D Pershing (n 14)

³⁸ 'Chandrayaan-1' (ISRO, 22 October 2008) <<https://www.isro.gov.in/Spacecraft/chandrayaan-1>> accessed 21 January 2021

³⁹ 'Mars Orbiter Mission Spacecraft' (ISRO, 05 November 2013) <<https://www.isro.gov.in/Spacecraft/mars-orbiter-mission-spacecraft>> accessed 21 January 2021

⁴⁰ 'How Space Activities Bill Will Change India's Space Domain For Private Players' (Firstpost, 2021)

<<https://www.firstpost.com/india/what-space-activities-bill-will-mean-for-private-players-in-space-domain-in-india-9849351.html>> accessed 21 January 2022

⁴¹ Space Activities Bill, 2017

government/private participation in space activities in India⁴², in accordance to its treaty obligations, but does not go so far as to regulate the extraction of outer space resources.

This author believes that India has the perfect opportunity to introduce space legislation that can also deal with the questions of space mining and property rights, aside from the aspects dealt with in the Space Activities Bill in its current form. In this respect, the country can either go the route followed by legislation in the US⁴³ or Luxembourg⁴⁴. However, the former of these options does not seem viable for India. This is because the huge difference in capabilities between the Indian and American Space Industries means that India is unlikely to succeed in any space mining endeavour if it were to go alone in a short period of time, and the fact that if India were to join the Artemis Accords with the US to obtain cooperation, it would be violating its long-held principles of Non-Alignment and cause the alienation of Russia, who has been a long term partner of India, especially in the space sector.⁴⁵ Further, the fact that the Artemis Accords have already faced challenges from other countries⁴⁶ means that it should not be, as yet, considered a stable regime that can be depended upon to conduct expensive and risky activities such as space mining, because such activities may come under complex legal challenges in the future that may be costly to resolve.

This means that following the example of Luxembourg seems more appropriate for India, as this would mean creating legislation that regulates the conduct of foreign actors in Indian jurisdiction as well as Indian actors all over the globe, which can allow for greater foreign investment into India in the space sector, as long as sufficient conditions are put in place to allow for accountability.⁴⁷ More importantly, the fact that India allows for a more globalised approach to space mining will allow the country to have a more balanced approach while shaping the international regime that will also need to be put in place before space mining can happen effectively. India has a responsibility to participate actively in the international

⁴² How Space Activities Bill Will Change India's Space Domain For Private Players (n 40)

⁴³ Competitiveness and Entrepreneurship Act, 2015

⁴⁴ Law of December 15th 2020 on Space Activities

⁴⁵ 'India-Russian Space Cooperation' (*Journals of India*, 5 September 2019) <<https://journalsofindia.com/indo-russian-space-cooperation/>> accessed 22 January 2022

⁴⁶ Loren Grush (n 18)

⁴⁷ Bob Calmes, Laurent Schummer & Blazej Gladysz-Lehmann (n 29)

discourse and try to bring about a legal regime that can bring about an equitable solution to the problem of sharing space resources and their benefits among the nations of the world, while also continuing to benefit from its own advances in technology and its capabilities. If it fails to act soon, it may end up side-lined in the international arena and lose out on opportunities to access the many crucial space resources that will soon be within Mankind's reach.