INTERNATIONAL SPACE LAW PRINCIPLES AND THEIR IMPACT ON COMMERCIALISATION OF OUTER SPACE

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Abstract

Regulation of activities in outer space was generally believed to have started immediately after the successful launch of the first artificial satellite by the Soviet Union in 1957, a date that was regarded as the beginning of the space age. However, years before the launch of sputnik, there had been many deliberations around the world on which laws are to be applicable to the space beyond state's airspace known as the outer space. This paper analysed the history preceding outer space activities and the roles played by the earlier proponents of airspace, and the United Nations in what was later known as the international space law. It examined important principles established by the five international space treaties for the peaceful uses of outer space, and their relevance to the present-day commercialization of outer space. The study employed doctrinal research method using both primary and secondary sources of data. The study established launch of sputnik was the catalyst for the United Nations to take measures which culminated in the space treaties within few years. The study also found out that many of the principles established in the space treaties appear to be contrary to the interests of the commercial sector in the space industry. The study recommended that the space treaties need to be modified in order to take care of the new era of the space age.

Keywords: Space treaties, Sputnik, non-appropriation, commercialization.

1.1 Introduction

Humans have always been fascinated with their environment but none of the fascinations can beat that of the outer space. Among the people captivated with space was Jules Verne who wrote many fiction stories in the 1860s depicting man's attraction with outer space.[1] Discussions on the need to regulate the area above airspace became the topic amongst lawyers before the space age even began.[2] The first known work on space was in 1910 by Emilie Laude,[3] who proposed that new law should control space,

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[1]See T. Masson-Zwaan and M. Hofmann, Introduction to Space Law (2019) 4th Edn. Wolters Kluwer 1

[2] The Space Race (History.Com, 22 February 2020) <https://www.history.com/topics/cold-war/space-race> accessed 30/10/2023; Aerospace, 'A Brief History of Space Exploration' <https://aerospace.org/article/brief-history-space-exploration>s accessed 30/10/2023

[3] S.E. Doyle, A Concise History of Space Law: 1910- 2009, in New Perspectives on Space law (53rd IISL Colloquium on the Law of outer Space, 2011)1; E. Laude, "Questions Pratiques" Vol. 1. *Revue Juridique Internationale de Locomotion Arienne* (1910) 16-18 Paris.

whilst stating that "the term Law of Space will thus be the generic term".[4] Vladimir Mandl published the first monograph on space law in 1932[5] while the first Doctoral Thesis on space titled "Air Law and Space" was defended in 1958 by Welf Henrich Prince of Hanover at the University of Gottingen, Germany.[6]

Space law originated from the need to establish laws that would govern the activities of states in the outer space.[7] Space law embodies other areas of public international law such as air, sea and humanitarian laws.[8] Technological advancements based on rocket science demonstrated during the second world war led to changes in the way legal deliberations around outer space took place. Most of the jurists involved in the debates on space law at the inception had their backgrounds in air law. One of which was Vladmir Mandl, who argued that the use of rockets in assessing outer space would precipitate issues that had not been settled by air law.[9] Subsequent writers emphasized the importance of regulating the new area internationally.[10]

Jurists such as Y. A. Korovin, among others, noted the challenges of overflight, including reconnaissance, bombing and other security risks. They argued that sovereignty over airspace was not disputed, it was recognized that the nature of the environment beyond the airspace known as the "ether" would not be easy for states to control,[11] and should be left outside the scope of the jurisdiction

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[4] Ibid., V.A. Zarzar wrote the second known work on outer space in 1926, Zarzar, an official of the Soviet Aviation Ministry raised important questions in his paper that borders on states' sovereignty over their airspace and the definition of boundary which formed part of the discussions in later works. V. A. Zarzar, "Mezhdunarodnoye Publichnoye Vozdushnoye Pravo" (Public International Air Law) [Problems of Air Law, a Symposium of Works by the Air Law Sections of the USSR and RSFSR Unions of Societies for Assisting Defence and Aviation and Chemical Construction] Vol. 1, 90-103, SSSR 1 Avikhim RSFSR, Moscow, 1927. Air space and outer space were adjudged as separate environments that have to be regulated by different laws.

[5] Vladmir Mandl was a Czechoslovakian lawyer and writer who observed the legal problems that might be drawn up by the way rockets were being deployed in European countries at that time. See V. Mandl, Das Weltraum-Recht: Ein Problem der Raumfahrt (1932) Mannheim, Berlin, Leipzig; J Bensheimer 48.

[6] Masson Zwaan Ibid.

[7] Peter Jankowitsch, The Background and History of Space Law in Frans von der Dunk and Fabio Tronchetti (eds) Handbook of Space Law (Edward Elgars Publishers, 2015) 1.

[8] Ibid.

[9] V. Mandl, *Das Weltraum-Recht: Ein Problem der Raumfahrt* (1932) 48.

[10] J.C. Cooper, The Boundary between Territorial Airspace and International Outer Space, in *Explorations in Aerospace Law: Selected Essays by John Cobb Cooper,* 1946-1966 (Ed. I.A. Vlasic) (1968) 289; R. Quadri, *Dirito Internazionale Pubblico* (1968) 5th Edn 685; C. Chaumont, Les problems du droit international de l'espace extra-atmospherique, in *Institute des Hautes Etudes Internationales de l'Universite de Paris* (1958) 3; N. M. Matte, The Law of the Sea and Outer Space: A Comparative Survey of Specific Issues, in 3 ocean Yearbook (1982) 13-37; E. Pepin, Introduction to Space Law (1958) 4 New York Law Forum 258-61; in Peter Jankowitsch, Background and History Space Law.

[11] S. E. Doyle, supra n 3, at 4, see also, E. Korovin, "La Conquete de la Strastophere et le Droit international" (1934) *Revue Generale de Droit International Public* (Paris) Vol. 41, no.6, 675-686.

of states. Korovin disagreed and noted that for all security reasons, states should have control over their airspace and beyond and be able to defend it.[12]

It was in the middle of the 1950s that the question of the peaceful use of outer space started cropping up in legal discussions. Discussions centred on whether states' sovereignty would prevent the overflight of objects that were meant for scientific reasons.[13] In addition, some maritime concepts such as the concept of innocent passage were considered. More academic works continued to pour in, and Arthur C. Clarke wrote the first English work in 1946, which assessed the effect of overflight on the society,[14] and canvassed for a limit on the sovereignty of states.

John Cobb, an air law expert, wrote the first United States work on outer space.[15] He raised concerns over missile passing through the airspace of a neutral state and the likely legal problems such might pose. In later years, he argued that international consensus had to be made on the upper limit of nation's sovereignty urgently before states began to pass through the airspace of others without permission. However, it was in a letter written by a British engineer in 1949 that a phrase that had become controversial over the years was coined, it was stated that "the Moon is not their property… it is the common heritage of man".[16] The letter was to address the US stance on the resources of the outer space. Another jurist, Lionel Lamming reasoned that the resources of the solar system were to be regarded as the common heritage of mankind.[17]

The concepts that formed most of the philosophy of space law developed in different jurisdictions with language barriers and lack of coherence by any institution. Professor Meyer of the University of Cologne in Germany did extensive work on air and space law. In the same vein, Professor John Cobb Cooper of McGill University extended the frontiers of knowledge on air and space law through his works at the University.[18] Around the world, universities were embracing the new area of law and

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[12] Ibid.
[13] Ibid.
[14] Arthur C. Clarke, "The Challenge of the Spaceships" (5 October 1946) British Interplanetary Society.
[15] S.E. Doyle, supra n 3 at 7, see also J. C. Cooper, 'International Air Law in I. A Vlasic (ed.) Explorations in Aerospace Law, McGill University Press, 1968 266-267. Cooper paper was titled "Future Use of Guided Missiles above the Airspace" and was presented at Newport, Rhode Island in 1948.
[16] See "Correspondence" to the *Journal of the British Interplanetary Society*, Vol.8, no.3, May 1949.
[17] Doyle, supra n 3, at 8.
[18] See generally A.B. Rosevear, 'John Cobb Cooper and McGill's Institute of Air and Space Law' (1962) Journal of Air Law and Commerce, Vol. 28, Iss. 4, 346

adding it to the curriculum. The 1950s witnessed increased number of scholarly works on space law.[19] The International Astronautical Federation (IAF) started the international efforts of space law.[20]

The Soviet Union declined to participate in the earlier work of the IAF[21] despite repeated invitations. It formally joined in 1955 when the plan was on for the International Geophysical Year, a program meant to investigate the earth with the use of man-made vehicles.[22] The IAF was an international forum for jurists on space law as it provided avenue for exchange of ideas. At the third congress in Germany, Professor Meyer's paper "Space Law" presented the new area of law to the participants.[23] Professor Meyer's work was very important as it addressed issues such as boundary problems and military utilization of space, and showed strong support for the work of Vladmir Mandl on many points.[24] Meyer's work became foundation for the works of others in subsequent years.

Welf Heinrich, Prince of Hanover defended the first Doctoral Thesis on space law in 1953, at the Georg-August University in Germany, entitled "Air Law and Space". It argued that the law of nature, technical and legal grounds necessitated keeping the space above the air space free from state sovereignty.[25] Andrew G. Haley brought greater attention to the dissertation outside Germany especially in the US and Europe where tours were organized for the two writers.[26] Others such as Kroell emphasized the need for international bodies to regulate the activities of the overflight, though it was unclear the role bodies such as the United Nations could play at that point.

It became necessary to allocate radio frequencies for effectiveness and smooth working of the astronauts. The importance of radio frequencies for the smooth running of space flight had been

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[19] J. C. Hogan, 'Space Law Bibliography' (1956) 23, J. AIR L. & COM 317 <https://scholar.smu.edu/jalc/vol23/iss3/5> accessed 20/09/23.
[20] A. F. Gigalt, 'The International Astronautical Federation and the Use of Space for Peaceful Purposes' (1962) 28 J. AIR & Com. 356 <https://scholar.smu.edu/jalc/vol28/iss4/7> accessed 20/09/23.
[21] Doyle, supra n 3, at 8
[22] The Britannica, 'International Geophysical Year' <https://www.britannica.com/event/international-Geophysical-Year> accessed 20/09/23.
[23] A. Meyer, 'Weltraumrecht' [Space Law] *Zeitschrift fur Luftrecht'* (1952) Vol. 1, 234-236.
[24] Doyle, supra n 3 at 11
[25] M.J. Sundahl and V. Gopalakrishnan (eds) New Perspectives on Space Law (2011) Proceedings of the 53rd IISL Colloquium on the Law of Outer Space at the International Institute of Space Law 40.
[26] Doyle, supra n 3.

recognized before that time.[27] Observers had started raising concerns about this[28] and calls were made for regulation at the states as well as international levels. The concerns of Jurists such as George Sterling[29] were not given attention to, though they had raised important serious observations about the implications of radio frequencies at the national as well as international stages.[30]

At this time, other landmarks were taken place in the US[31] and other parts of the world, including the Latin America[32] and in Europe.[33] The decision of the US and Soviet to launch satellites as part of the International Geophysical Year (IGY) activities increased the number of scholarly works published on the subjects.[34] Issues concerning space law were being addressed at many of the international conferences and congresses at the time.[35] At one of the conferences, the lack of available materials on space law and miscommunication was raised and later addressed by the establishment of the International Institute of Space Law.[36] All around the world, articles and academic papers on space law were being written and beginning to gain momentum,[37] even at the Soviet Union.[38]

The international laws of the air especially the Chicago Convention was adjudged as incapable of regulating space flight,[39] especially as many of its concepts would not be applicable to space flights.[40]

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[27] Nandasiri Jasentuliyana, 'Regulatory Functions of I.T.U. in the Field of Space Telecommunications' (1968) 34 J. AIR L. & COM. 62 <https://scholar.smu.edu/jalc/vol34/iss1/4> accessed 20/09/23

[28] Doyle, supra n 3, at 13; see also G.E. Sterling, 'Utilisation of Radio Frequencies in Connection with Rockets', A Presentation before the National Capital Section of the American Rocket Society, Washington D.C., April 2, 1954, published in Jet Propulsion, vol.24, no. 5, September-October, 1954, 322-23 cited by Doyle.

[29] Ibid

[30] Ibid

[31] The establishment of The US National Committee for the International Geophysical Year took place in 1995; W. Sullivan, Assault on the Unknown, McGraw-Hill, New York, 1961.

[32] See the works of Professors Teofilo Tabanera and Aldo Cocca of Argentina.

[33] See the articles and other works done by Cyril Horsford and C. Wilfred Jenks.

[34] Doyle, supra n 3 at 14.

[35] Royal Museums Greenwich, Space Race Timeline, <https://www.rmg.co.uk/stories/topics/space-race-timeline> accessed 20/09/23.

[36] E. Pepin, International Institute of Space Law of the International Astronautical Federation: A Brief History (1982) AIAA, Reston VA.

[37] The first Japanese article on space law was published in 1956; R. Taoka, 'Airspace Sovereignty', A Presentation to the Third Japanese Aviation Law Society's General Assembly (May 1956) in Doyle.

[38] Doyle, supra n 3 at 16, B. Kucherov, Astronautical Sciences and Aviation in the Soviet Union: A Bibliography (1955) Library of Congress, Washington DC in Doyle.

[39] M. Smirnoff, '1960-1970: What is Space Law? The Need for a New System of Norms for Space Law and the Danger of Conflict with the Terms of the Chicago Convention' (2020) in S. Hobe (ed) Six Decades of Space Law and Its Development(s) 1960-2020, The International Institute of Space Law 16.

[40] See Article 3 of the Chicago Convention and Annex A of the Paris Convention of 1919.

Air law is enshrined in sovereignty that cannot operate in outer space because sovereignty should be capable of being defended and ascertained. These important features were absent in outer space.[41]

During the IGY, space flights passed through the airspace of others without protests. The lack of protests might have been due to the lack of understanding of the danger posed by space flights to humanity; and the lack of legal basis for the objections.[42] The absence of rules created serious threats to all states, humans and airflight alike. Scholars then agreed on the need for regulation of space flight and that an international convention should hold, the only challenge then was whether the platform of the International Civil Aviation Organisation (ICAO) or that of the United Nations should be employed. It was later agreed that UN should be involved with space discussions from the outset.

2.1 The Sputnik Years

Space age is believed to have started officially with the launch of the first artificial satellite, Sputnik-1 on 4 October of 1957 by the Soviet Union. This was done by the Soviet without the permission of states whose airspace the satellite had to pass through.[43] The United Nation Committee on the Peaceful Uses of Outer Space (UNCOPOUS) was established in 1959 with the tasks of regulating outer space.[44] The push towards creating a new set of rules that would regulate the new area became necessary as a result of the fierce competition between the two world powers of that time; the United States of America and the Union of Soviet Socialist Republics (USSR) whose competition was already becoming worrying for the global community.

In their bid to dominate and outshine others, the two world powers employed all sort of means such as "military, political and technological".[45] Eventually, the push for creating a new area of law came from political considerations. The competition between the US and the Soviet was becoming unsafe with the breakthrough they were having in nuclear science, and considering the weapons that had been

[41] Smirnoff, at 16; the author noted that the altitude of outer space (2000 miles) may be difficult to defend by any state and pinpointing that altitude itself is not without challenges.
[42] Ibid.
[43] Svea Anderson, Outer Space as a Theatre of War, Legitimate Attacks on Dual-Use Satellites? (2018) Master's Thesis in Public International Law, particularly Space Law, 30 ECTS 6; D. Andoni, 'The Ultimate Space Law Collection' (2013) Wolf Legal Collection, Vol. 1, 3.
[44] Ibid.
[45] Peter Jankowitsch, supra n 7, at 3.

deplored on land, sea and air, it became urgent that this new area should be regulated before wars were taken to the higher ground.[46]

The suddenness and element of surprise that the launch of Sputnik had especially on the US led to fears that the US was likely to respond in time. However, in a surprising twist, the two world powers refrained from taking arms to the outer space. Jankowitsch believed that economic and technological constraints might have been the reasons behind the restraints exercised by the two leading states.[47] There was an agreement by the two to bar positionings of nuclear weapons and armaments of mass destruction in outer space.[48] The UN General Assembly came in and worked on maintaining the peaceful uses of the outer space which led to the first international treaty on space. The Committee on the Peaceful Uses of Outer Space (COPOUS) was established as an arm of the UN General Assembly, and in order to do its work, two subcommittees were established to wit: The Scientific and Technical Sub Committee and The Legal Sub Committee. The works of the Sub Committees produced the space treaties.[49]

2.1.1 Space Treaties Era

Freeland noted that "…the United Nations space activities were formulated in an era when only a small number of countries had space-faring capability…the international law of outer space thus, at least partially, reflected the political pressures imposed by two space superpowers of that time".[50] The duty of creating a legal regime for the regulation of outer space fell on the UN and in 1967, it came up with the Outer Space Treaty which established space as a place free for exploration and use of all mankind without any form of discrimination irrespective of the level of development of any state.[51]

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[46] Ibid.
[47] Ibid
[48] Ibid, see also The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (hereafter Partial Test Ban Treaty) Moscow, done 5 August 1963, entered into force 10 October 1963; UNTS 43; TIAS No. 5433; 14UST 1313; UKTS1964 No.3; ATS 1963 No.26.
[49] R. Kaul, Legal Dimensions of Commercialisation of Space (May 2023) N. Jagota (ed),Vivekananda International Foundation <https://www.vifindia.org/sites/default/files/Legal-Dimensions-of-Commercialisation.pdf> accessed 5th July 2023.
[50] S. Freeland 'International Law in Commercial Space 'World': Historical Lessons and Future Development' in B.C. Odom, 'NASA and the Rise of Commercial Space' (2021) <https://www.nasa.gov/sites/default/files/space_portal_brian_odom.pdf accessed 5th July 2023>.
[51] Ibid, (Kaul)

The treaty prohibited placing nuclear weapon for mass destruction of outer space on any celestial bodies.[52] Military activities were not prohibited on outer space as long as the activities bothered on scientific and peaceful purposes.[53] The second major treaty was the Rescue Agreement of 1968.[54] The Liability Convention of 1972[55] came afterwards. The fourth treaty was the Registration Convention of 1974.[56] The last treaty and the least to enjoy major acceptance is the Moon Treaty of 1979.[57] It is important to discuss the general principles established by the treaties below:

i. Freedom of Use and Exploration of all States

This principle is founded in the Outer Space Treaty (OST) to the effect that outer space is an area that cannot be claimed by any state, and it is similar to what obtains in the high sea.[58] The right is contained in Article 1(2) of the OST and embodies the right of use, exploration and accessibility. Every state on earth has the same rights to outer space, but such rights have to be for the benefit and in the interest of all states. The meaning of the doctrines is not stated in the treaty, and freedom of use entails international cooperation in the use of outer space, that is, to be the guiding principle of states in their use of space whether for exploration and/or for exploitation. Exploration of space entails technical and scientific investigation of space for the betterment of humanity and mankind, encapsulated in the following words:

> In fact, scientific and technical advances in a number of areas of learning related to space exploration have already made possible several specific practical measures to put space to use. Space research and the practical utilization of its results have to benefit the whole of mankind, and it is for that reason that the exploration and use of outer space are described in the treaty as 'the province of all mankind.[59]

The observation is that this principle will strengthen relationships amongst states in the use of space in order to advance international cooperation in exploring space for peaceful purposes. The principle has a guideline for states.[60] No state shall be discriminated against in the use of space, as the outer

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[52] Ibid.
[53] Article IV of the Outer Space Treaty.
[54] The Rescue Agreement is known as the Agreement on the Rescue of Astronauts, Return of Astronauts and the Return of Objects Launched into Outer Space.
[55] The Convention on International Liability for Damage Caused by Space Objects.
[56] The Convention on Registration of Objects Launched into Outer Space of 1974 has been ratified by 72 countries.
[57] The Moon Treaty is known as the Agreement Governing Activities of States on the Moon and other Celestial Bodies.
[58] Tosaporn Leepuengtham, *The Protection of IP Rights in Outer Space Activities* (Edward Elgar Publishing Limited 2017) 16
[59] G. Zhukov and Y. Kolosov, International Space Law (2014) 2nd edn., Statut Publishing House, 51, 45.
[60] Ibid.

space is open to all states equally. The right and freedom came with the obligation of ensuring that no state places impediment(s) on the way of other states seeking to use outer space. The principle of respect for the right of others is to bind all states.[61]

Respect for other states' use extends to other space in the sense that states are not to interfere with the flight of another state or any object launched into space. It is only the state of registration that can exercise authority over an object unless where an international law has been breached. Even in the instance of a breach, the offending state can only be reported to the international bodies.[62]

ii. **Non-Appropriation Principle**[63]

The non-appropriation principle has its background in the wordings of the Outer Space Treaty and the Moon Agreement. The principle means that no state can lay claim to any part of the outer space as its own; the principle is to guarantee that there would not be any dispute as to the lunar surface. No state can lay claim to exclusive proprietary rights over the lunar surface, every state has free access to the lunar resources.[64]

While at the inception of the space treaties, there were little or no doubt about the meaning of the non-appropriation principle, because it was understood that the outer space must be kept from the clutches of the world powers then,[65] especially from the possibility of nuclear wars. In recent times, because of the commercialisation of the outer space, the principle had become one of the most contested principles of the outer space.[66] Technology that was not available at the time of the draft is now available and accessible. Technology has made the possibilities of the lunar surface obvious[67] and has become a major drive for the private actors involved in space activities.[68]

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[61] J.I. Gabrynowicz, 'Space Law: Its Cold War Origins and the Challenges in the Era of Globalisation' (2004) 37 Suffolk U. L Rev 1041.
[62] Article VIII of the Outer Space Treaty.
[63] Article II of the 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".
[64] P. Das and G. Khanna, 'Circumventing the Non-Appropriation Principle of International Space Law' (May 11, 2022) <https://www.berkeleyjournalofinternationallaw.com/post/circumventing-the-non-appropriation-principle-of-international-space-law> accessed 8th July, 2023.
[65] J. I. Gabynowicz, supra n 61 at 1043.
[66] A. D. Pershing, 'Interpreting the Outer Space Treaty's Non-Appropriation Principle: Customary Law from 1967 to Today' (2019) Yale Journal of International Law 154; J. G. Wrench, 'Non-Appropriation, No Problem: The Outer Space is Ready for Asteroid Mining' (2019) CWRJIL, Vol.51, Iss.
[67] L. Signe and H. Dooley, "How Space Exploration is Fueling the Fourth Industrial Revolution" (The Commentary, March 28, 2023) <https://www.brookings.edu/articles/how-space-exploration-is-fuelling-the-fourth-revolution/> accessed 20/09/23/
[68] Ibid.

There is a gradual shift in interpretation of the principle now, and most of the push for changes are emanating from the private sector through domestic legislation.[69] The most popular example is the Spurring Private Aerospace Competitiveness and Entrepreneurship (SPACE) Act of 2015. Luxembourg followed suit in 2017 with the 'On the Exploration and Utilisation of Space Resources' [70] and United Arab Emirates has joined also.[71]

iii. Outer Space is to be Used for the Benefit and in the Interest of All States[72]

The space treaties established that the benefit of outer space is to be for and in the interests of all states irrespective of their level of development. Article I of the OST is to the effect that:

> the exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of the degree of economic or scientific development, and shall be the province of all mankind.[73]

Some argued that the once collaborative efforts in the use of space have been replaced with each state seeking to protect their interests in space, the idea of acting in the best interests of all states will be purely ambitious.[74]

iv The Province of All Mankind

Article I of the OST makes the outer space the province of all mankind, there is a notion of common interests in outer space.[75] Benefit of the use of space should be for all humanity, in essence, every state irrespective of their level of economic or scientific developments has a right to the profit of space exploration. Article I of the OST states as follows:

> The exploration and use of outer space including the Moon and other celestial bodies shall be carried out for the benefit and in the interests of all countries

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[69] A. D. Pershing, 'Interpreting the Outer Space Treaty's Non-Appropriation Principle: Customary International Law from 1967 to Today' (2019) YALE J. INT'L L 44.
[70] Ibid at 160; see Philip De Man, 'Luxembourg Law on Space Resources Rests on Contentious Relationship with International Framework' (2017) Leuven Centre for Global Governance Studies.
[71] Ibid.
[72] See J. R. LittleJohn, 'Space for All: Using Diplomacy to Bridge the Space Divide' (U.S. Department of State, 7, October 2022) <https://www.state.gov/space_for_all> accessed 8th July 8, 2023.
[73] Article I of the Outer Space Treaty of 1967.
[74] G. Posorke, '"The Province of All Mankind": Rethinking the Outer Space Treaty of '67' (Brown Undergraduate Law Review, May 2, 2022) <https://www.brownulr.org/blogpost/the-province-of-all-mankind-rethinking-the-outer-space-treaty-of-67> accessed 8th July, 2023.
[75] F. Lyall and P.B. Larsen, *Space Law, A Treatise* (2nd Edn, Routledge London, 2018) 53.

> irrespective of their degree of economic or scientific development and shall be the province of mankind

Interpreting the phrase, *province of all mankind* had been riddled with difficulties, it remains unclear as to its meaning, whether it applies to states directly or to all humanity as whole. How are the benefits to be shared, should it be on the basis of technology transfer or just by making the activities generally beneficial.[76]

iv. Application of Relevant International Laws to Outer Space

All space activities are to be carried out in accordance with the principles of international law, including the Charter of the United Nations.[77] This means that relevant international laws would be applicable to space activities. Article I of the OST re-emphasizes the importance of international law to space exploration and exploitation. Kolosov and Zhukov noted that for references to be made about a matter twice in the same treaty, underscores its importance, and that Article I has relevance to specific rules of international law, but it is not in all situations that arise between states that international law would apply.[78] According to Lyall and Larsen, "space is not lawless: it is not somewhere where one is free of legal constraint or principle".[79] Where space law is silent on any matter of space activities, the provisions of the international law would govern such,[80] it would be wrong to argue that there is lacuna in international space law since it has been declared that states are to act "in accordance with international law, including the Charter of the United Nations".[81]

Some jurists faulted the wordings of the above provision noting that international law cannot be applied to outer space and celestial but to what states are engaging on in outer space. Kolosov and Zhukov held that the import of the provision is not to just make all provisions of international law applicable in outer space but more specifically the general principles of international law by which states are generally bound. They held that "the specific principles and rules of international space law have to be (and are) in harmony with the generally accepted fundamental principles of international law".[82]

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[76] Ibid at 57.
[77] Article III of the OST.
[78] Zhukov and Kolosov, supra n 59 at 51.
[79] Lyall and Larsen, supra n 75 at 54.
[80] G. Zhukov and Kolosov, supra n 59
[81] Ibid.
[82] Ibid.

v. Banning of Placement of Weapon of Mass Destruction on Outer Space

Article IV[83] established this principle. It must be noted that military activities are not banned on the are for scientific and peaceful purposes. Article IV bans the placement of nuclear weapons and/or weapons of mass destruction in outer space, on celestial bodies or around the earth.[84] This was first laid out in UN General Assembly Resolution 1884.[85] Jenks opined that the resolution was just a custom of international law but does not absolve states from obeying its provision.[86] The essence of the resolution was to prevent arm race in outer space and celestial bodies and to ensure that outer space does not become a theatre of war, which was originally laid down in the wordings of the "Moscow Treaty Banning Nuclear Weapon Tests in the Atmosphere, in the Outer Space and Under Water" which came into existence in August of 1963. The Moon Treaty further mandated that the moon and other celestial bodies are for peaceful purposes. While military installations, fortifications and weapons testing are banned, the military can conduct scientific research for peaceful purposes.

2.1.2 National and Domestic Space Law Era

At the national level, space law was developed especially for most space faring states.[87] States carried out[88] the national regulation of space in different ways, such as the creation of legal frameworks for space; the application of existing national laws to space matters; and the adaptation of international laws on space. Privatisation of space activities also made the relevance of national regulation of space obvious in areas such as contracts, torts, and dispute settlements mechanism.

3.1 The Commercialisation of Outer Space

The global market for the space industry has grown exponentially, and commercialisation of outer space will likely enlarge the market in the next few years,[89] but it is important to consider the evolution of the commercial aspect of the outer space here. The first commercial satellite that was placed into

[83] Article IV of the OST
[84] Ibid.
[85] UNGA Resolution 1884 restrain states "from placing in orbit around the Earth any objects carrying nuclear weapons or any other kind s of weapons of mass destruction or from installing such weapons on celestial bodies".
[86] C. W. Jenks, *Space law* (Stevens and Sons, London 1965)
[87] Larsen and Lyall, supra n 75, at 28.
[88] Ibid, at 29.
[89] E. T. See, 'Commercialisation of Space Activities—The Laws and Implications' (2017) 82 J. AIR L. & COM 145 https://scholar.smu.edu/jalc/vol82/issl/4 Accessed 5th July 2023.

orbit was a telecommunication satellite placed in orbit around the mid1960s.[90] National Aeronautics and Space Administration (NASA) was at the forefront of the transportation to outer space and most state governments and private companies had to go through them to launch their payloads.[91] Space transportation sector was mainly the preserve of the United States until the European Space Agency started their space transportation known as the Expandable Launch Vehicle (ELV), and launched its first flight in 1979 and the first commercial flight in 1984.[92]

The US started the Shuttle System in the late 1970s, by launching governments and private satellites into orbit. However, the shuttle failed to meet all the demands and that led to the consideration of private commercial flights. The first commercial flight was conducted in 1982 after a long legal and procedural battle which led to the establishments of domestic laws to ease commercial launch services.[93] The push for commercial space transportation was hinged on the benefits that the US stand to gain such as:

> Maintaining a high-technological industrial base; providing jobs for thousands of workers, thus adding to the federal tax base; spawning numerous spinoff and supporting activities; strengthening the U.S global position; providing a potential market for excess flight hardware, special-purpose tooling, test equipment, and propellants; and creating a market for U.S government and facilities.[94]

The U.S government showed support for the commercialisation of the space vehicle by committing to licence, supervise and regulate the commercial sector in order to meet the needs of both the local and international customers.[95] A Department of Transportation was established to be in charge of the commercial space flight in 1983,[96] with the goal of maintaining interests of the public in commercial space sector by "removing regulatory barriers".[97] The Department of Transportation (DOT) was meant to be a one-stop agency that would combine the work of many other agencies thereby easing the

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[90] N. V. Til, 'The Commercialisation of Outer Space' (2013) Honors Projects, 191, https://scholarworks.gvsu.edu/honorsproject/191 accessed 6th July 6, 2023.
[91] Origins of the Commercial Space Industry, FEDERAL AVIATION ADMINISTRATION, <https://www.faa.gov/about/history/milestones/media/commercial_space_industry.pdf> accessed 5th July 2023; J. Robin, 'Space is getting Crowded: The Laws Governing the New Commercial Space Race' (2021) Loyola Maritime Law Journal, Vol 22.
[92] Ibid.
[93] George Nield et al, 'The Origin and Practice of U.S. Commercial Human Space Flight Regulations' (2008) International Astronautical Congress 1.
[94] Origins, supra n 91.
[95] Ibid.
[96] Nield, supra n 93 at 1.
[97] Ibid.

requirements for licencing. The DOT established the Office of Commercial Space Transportation[98] to be in direct charge of the commercial sector.

The Commercial Space Launch Act was enacted in 1984 for "licensing and regulation; liability insurance requirements; and access of private launch companies to government facilities".[99] Private companies in the US seemed to turn a cold shoulder to the offers by the government, probably because it was not easy to contest with state government in the space sector. It was not until the Challenger Accident of 1986[100] that things improved, probably due to the fact that "the government reversed its policy of phasing out ELVs and instead adopted a mixed-fleet approach where both ELVs and the shuttle were available for commercial users".[101]

Gradually, the role of NASA in providing transportation was becoming reduced, the government limited their involvement to highly technical satellites requirements and/or where another foreign policy consideration was involved. With limited services offered by NASA for civilian launches and the legal framework already established, the U.S. Commercial launch services sector began. The final push came in the form of directive by the President on February 11 1988 for government agencies to patronize commercial sector for launch services.[102] The first commercial launch came in March 1989, and another one in August of the same year.

When public supports and government funding decreased, the U.S lagged behind in space exploration which led to the enactment of the Commercial Space Act of 1998, meant to give the commercial space sector the needed boost to take off. Commercialistion of all aspects of the industry, including the International Space Station (ISS) was encouraged, the aim was to reposition America back as a world leader in the space sector.[103] The policy of the US government in 2004 known as the U.S. Space Exploration Policy further drummed up supports for the private sector, the emphasis shifted from only

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[98] Ibid.
[99] See Origins of Commercial Space Industry.
[100] Arjen Boin, 'Learning from Crisis: NASA and the Challenger Disaster' (2008) <https://www.researchgate.net/publications/256293646> accessed 20/09/23.
[101] Origins of Commercial Space Industry.
[102] Ibid.
[103] R. M. Barton, 'Technology and the History of Commercial Spaceflight' (Purdue University Online, 02 February, 2022) <https://polytechnic.purdue.edu/purdue-online/blog/technology-history-of-commercial-spaceflight> accessed 6th July 6, 2023.

government's projects to private space flight.[104] An important aspect of the policy is the plan to use commercial flights to render services to the International Space Station.[105]

Private companies started taking advantage of the NASA's supports, offers, and funding by establishing their space companies. One of such to grab the opportunity was Elon Musk's Space-X company which also became the first private company to take supplies to the ISS in 2012. The success of the Space-X missions had boosted confidence in the capability of the private and commercial companies to render most if not all the services that used to be the exclusive preserve of the state governments.[106]

Over the years, the focus moved from what drove the space sector at the beginning such as national pride and prestige, which reflected in changes to the law as time went on. The most recent law on commercial space sector was the U.S. Commercial Space Launch Competitiveness Act (CSLCA) of 2015, also known as the SPACE Act. The purpose of the Act was to encourage investment in the private space sector by creating a stable legal regime. The SPACE Act was intended to make acquisition of licences flexible and easier. It sought to reduce the stress of getting approvals from the relevant agencies, but the most important aspect of the SPACE Act is the property right it gave to Americans to exploit resources from the celestial bodies.[107] Peterson noted as follows:

> The intent of the U.S Space Competitiveness Act is to allow private sector American businesses the legal opportunity to build and protect a robust commercial outer space economy, but does so seemingly against the principles established in the U.N Outer Space Treaty.[108]

The Act entitles United States citizens to any asteroid resources mined from the outer space and celestial bodies as long as they are engaged in commercial activities. The rights include possessory and disposal rights over lunar resources as long as the applicable laws are complied with including the international laws that the United States are party to. The implication of the Act seems to be the rejection of the doctrine of *res communis* but it appears that the Act will only be applicable when it involves commercial usage and does not appear to apply to individuals. An important case that

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[104] Ibid.
[105] Ibid
[106] Ibid
[107] Ibid
[108] Lauren Peterson, 'Governing the Unknown: How the Development of Intellectual Property Law in Space Will Shape the next Great Era of Exploration, Exploitation and Invention' (2021) 18 Nw. J Tech & Intell Prop 335 at 342.

illustrates the above is the US case of Nemitz v United States,[109] where an individual sought to lay claim to property rights of a part of the lunar and wanted to charge the NASA for using his property. His claim was rejected by the court.

Advancements in technology and availability of funding has changed the focus of the private sector involved in space activities. Other than transportation, the goal is to take humans to space now and to exploit space resources. Few of the new focus of the industry will be discussed below:

3.1.2 Space Tourism

Transportation to space had been a major drive in the industry, but now with the advances witnessed especially those being pushed by private companies such as Space-X, Blue Origin and Virgin Galactic, the drive is now towards tourism, that is bringing humans to space for a fee. The prospects of huge benefits to be gotten from tourism, though it may appear futuristic, is a major consideration for the private companies. According to Til, space tourism can be categorized into four parts;

> space tourism, intercontinental travel on earth via space, transport to private or government owned vessels such as the International Space Station, and corporate sponsorship from companies not involved directly with space travel.[110]

Space as the ultimate destination is a good marketing strategy, with customers willing to pay huge amount of money[111] to experience the thrill of being close to celestial bodies. The private companies are set to harvest huge profits[112] from rendering their services to willing customers. At present, many customers have already paid and are just waiting for the ultimate journey. Til observed the following:

> The early stages of space tourism will consist of short suborbital flights into space. These daytrips to space allow for tourists to experience the weightlessness of space and to view earth as a whole. Earth's wealthy patrons are already taking advantage of this opportunity. With continued support from the wealth, the space tourism industry will be able to flourish. The next step for space tourists will be staying in space for extended periods of time on a commercial space station…[113]

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[109] Nemitz v United States; see Xploration Station, 'Man Sues NASA for Landing on His Asteroids' <https://www.xploration.com/stories/Man-Sues-NASA-For-Landing-On-His-Asteroid> accessed 20/09/23.
[110] Til, supra n 90, at 4.
[111] Christian Davenport, 'You Are Now Free to Move About the Cosmos… If You Can Afford It' (The Washington Post, June 8, 2021) <https://www.washingtonpost.com/technology/2021/06/08/space-tourism-wealthy-bezos-musk-branson> accessed 20/09/2023.
[112] The Economic Times, Virgin Galactic Offering Space-Tourism Tickets Worth over $450k, Long Waitlist—All You May Want to Know' https:m.economictimes.com/news/international/us/virgin-galactic-offering-space-tourism-tickets-worth-over-450k-long-waitlist-all-you-may-want-to-know-articleshow/101403141.cms accessed 20/09/23.
[113] Til, supra n 90, at 5

3.1.3 Space Innovations

The success of the commercial space flights has been attributed to the innovations and cost cutting technologies they have come up with. Companies like Space-X has reduced the costs of launches by building rockets at a reduced cost, lower costs are achieved by building reusable rockets. Most of the rockets built by NASA were hugely pricey and could only be used once, whereas the ones built by private companies were lower in price. This informed the decision of the NASA to contract many of their services to commercial companies. NASA had in recent years been building their space vehicles using the private companies due to cost efficiency.

The introduction of reusable vehicles actually proved to be a major defining point for the industry. Space vehicles are designed in a way that can now be used several times like airplanes. The innovation has encouraged many other companies to develop their own reusable vehicles, the result of the innovation is that the costs of space launches has reduced, leading to increased interests in the sector.

Aside outstanding innovations, the commercial sector has witnessed setbacks also, which can sometimes prove fatal,[114] thereby causing public distrusts in the affected companies.[115] These accidents and setbacks are part of the teething problems experienced by the industry. Transporting humans into space still remains part of the major drive for the private commercial sector. While mars colonization may be in the future, there is no doubt in the mind of the industry watchers that the sector will come up with great innovations that will greatly impact lives both on earth and probably in space also.[116] Barton argued that commercial space flights must be integrated into aviation flight in a seamless manner in order for the industry to grow. This, the author observed can be achieved by constructing rockets like airplanes, thereby making space flights easier and more accessible.[117]

4.1 Evolution of Intellectual Property Rights in Outer Space

The issue of Intellectual Property (I.P) rights in outer space came to the fore only because of the private and commercial sector's involvement in space technologies and flights.[118] I.P rights were not really

[114] Virgin Galactic had fatal accidents in 2004 and 2014.
[115] Space-X accidents in 2006 and 2015
[116] Barton, supra n 103.
[117] Ibid.
[118] A. Singh, 'India: Intellectual Property Law and the Outer Space: A Promising Future Ahead? (06December, 2018) Khurana &Khurana Advocates and IP Attorneys, https://www.mondaq.com/india/trademark.762020/intellectual-property-law-and-the-outer-space-a-promising-future-ahead accessed 6th July 6, 2023.

considered when state governments were at the forefront of space activities, but for the private sector, protection of their IP rights is central to their involvement in the space sector. Since the Space Treaties have their roots in the cold war rhetorics, little or no provision was made for intellectual property rights. According to Balsano,

> intellectual property rights (IPRs) raise a number of important legal questions with regard to space activities. These questions, which concern, for example, ownership of intellectual property, infringement of IPRs, sharing of IPR, protection of data, and transfer of IPRs, have to be addressed before any international cooperative effort can result in inventions or an infringement of IPRs can be implemented.[119]

The incursion of the private and commercial actors in space activities made it pretty obvious that intellectual property rights are germane to the development of the commercial space flights. IPR was recognized as the driver for the future of space as it will be likely unreasonable to invest huge capital in space and not be allowed to take advantage of IP rights. The only way to attract the needed investment is the promise of advantage that can be gotten through IPR.[120]

Recent activities in space sector were what made the focus on IP come into limelight. Space law did not envisage IP rights as noted above, and the differences in the history of the two areas of law brought some frictions.[121] Historically, no IP rights exist in outer space, especially as the outer space is considered the common heritage of mankind as enshrined in the provisions of the OST. However, Article VIII of the OST gave states jurisdiction over objects launched into orbit provided that the object had been registered. As long as a state maintains jurisdiction, it can register any invention that was carried out on the space objects. Challenges are likely to arise where two or more states launch a space object, in that case, the parties will have to agree as to which state to be considered as the launching state, on whose territory an invention will have to be registered.[122]

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[119] A.M. Balsano, 'Intellectual Property Rights and Space Activities' (1994) European Space Agency, <https://www.esa.int/esapub/bulletin/bullet79/balsano.htm> accessed 6th July 2023.

[120] J. Stuart and M. Martensen, 'Intellectual Property Rights in the Global Commons of Space' (2019) 35th Space Symposium, Technical Track, Colorado Springs, USA. <https://www.spacesymposium.org/wp-content/uploads.2019/11/Paper-Stuart-Jack-Intellectual-Property-Rights-in-the-Global-Commons-of-Space.pdf> accessed 6 July 2023.

[121] Ibid

[122] S. I. Fortune, 'Feasibility of Legal Protection of Intellectual Property in Space' Law Pavilion Blog at <https://lawpavilion.com/blog/feasibility-of-legal-protection-of-intelectual-property-in-space/> accessed 6 July 2023.

Few of the provisions under the space treaties have relevance for IP. Article 15 of the Moon Agreement is one of such provisions. It gave a right of inspection to "all coexisting states on the relevant areas".[123] Avveduto opined that the purport of Article 15 is likely to be for private companies who might be reluctant in giving access to foreign inspectors that are likely to be competitors.[124] Interests in intellectual property rights in outer space began with the commercialisation of outer space and then moved to the work being done at the International Space Station.[125] Yet, the areas still remain a hugely contested aspect of law, the reason for this may be as noted by Fortune:

> although the national laws and international agreements providing for intellectual property protection on earth are well-known and unresolved areas are fairly well-defined, but in space, intellectual property protection is subject to greater unknowns. The technology is often novel and the law at best developing.[126]

Article II of the OST must be read alongside Article VIII to give IP rights to a state that had launched an object into space as

> Enforcement of intellectual property rights relating to creations that were made in outer space but also used in one or more territories of the earth which in general is governed by national or regional law whichever is concerned.[127]

None of the major space treaties discussed intellectual property in great details, but by attaching the actions on outer space to state parties' jurisdiction,[128] it can be said that the domestic laws of states will also bind activities in outer space and this will entail intellectual property rights also. In addition, Article XIII of the OST also addressed IP rights, but the most comprehensive legal framework can be found in the agreement created for the operation of the international space station (ISS) known as Intergovernmental Agreement of 1998.[129]

4.1.2 The Intergovernmental Agreement Relating to IP Rights

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[123] R. Avveduto, 'Comment, Past , Present, and the Future of Intellectual Property in Space: Old Answers to New Questions' (2019) 29 Wash. L. Rev. 203, <https://digitalcommons.law.uw.edu/wilj/vol29/iss1/17> accessed 6th July, 2023.
[124] Ibid, at 220.
[125] I. Bouvet, Certain Aspects of Intellectual Property Rights, (1999) Thesis Submitted to Faculty of Law, Air and Space Law Institute, McGill University Montreal, <https://www.nlc-bnc-ca/obj/s4/f2/dsk3/ftp04/mq64265.pdf accessed 6th July 2023>.
[126] S.I. Fortune, supra n 122.
[127] Intellectual Property Technology <https://www.khuranaandkhurana.com/2021/11/19/space-law-protection-the-new-focus-of-ipr> accessed 6th July, 2023.
[128] See Article VIII of the Outer Space Treaty
[129] Hamza Hameed, 'Intellectual Property Rights in Outer Space' November 30, (2016) Space Law Resource

The Intergovernmental Agreement (IGA) was developed to address working relationships of states involved in the International Space Station. The ISS came as a result of invitations extended by the U. S government to other space faring states which was followed by years of negotiations involving NASA and national space agencies of the other states.[130] The IGA was the guiding principles for the ISS but other bilateral and multilateral agreements were also reached.[131] The IGA of 1998 replaced the 1988 Agreement between U.S and few other states, and is dubbed the biggest scientific cooperative work in history.[132] It covers all aspect of the activities on the ISS.[133]

Intellectual property is covered by Article XXI of the 1998 IGA, it states that "an activity occurring in or on a Space Station flight shall be deemed to have occurred only in the territory of the Partner State of the element's registry".[134] Any invention that occurred on the ISS would be taken to have been done on the state jurisdiction that has the element where the invention took place. In essence, the national laws of the partner state become applicable to their activities at the ISS.[135] Protection of patent is therefore found in Article XXI of the IGA, and is vest on state of registration, but the protection has limitations; rights can only be enforced by the state issuing the grant.[136] The right guaranteed under Article XXI subsists irrespective of the fact that a Partner State participate in another activity on another state's flight element.

5.0 Conclusion

The Outer Space Treaty[137] did not contemplate property rights, it rather gave room to different interpretations by the states. Most of the conflicts around property rights expose the conflict between the post-war era and history of international law.[138] According to Blount

> International law emerges from the European continent in the form of rules that European powers used to stabilize the region and differentiate it from other regions that could be subjected to European power. Indeed, until 1945, the idea of "civilizes" reigned supreme in determining which territories had rights under international law and which might be subject to imperial power. Not surprisingly, in the early days, Europe was "civilized" and the rest of the world was not. As

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[130] Rochus Moenter, 'The International Space Station: Legal Framework and Current Status' (1999) 64 J. AIR L.& COM. 1033 <https://scholar.smu.edu/jalc/vol64/iss4/3> accessed 20/9/2023.
[131] Ibid
[132] Ibid at 1035
[133] Ibid
[134] Ibid
[135] See Article XXI of the 1998 IGA, Article VIII of the OST and Article II of the Registration Convention.
[136] Rochus Moenter, supra n 130 at 1053.
[137] See Article II of the Outer Space Treaty.
[138] P. J. Blount, 'Outer Space and International Geography: Article II and the Shape of Global Order' (2018) New England Law Review, Vol.52, Iss.2, 105

> subsequent iterations of international legal order were articulated, more places became "civilized" in a European sense. The global spatial order was reworked, but within a framework built on pre-existing western values.[139]

Thus, the concepts of property rights were predominantly based on the western concepts of property, theories like natural law an Lockean theory became integrated into international law and formed the background of many laws such as the space treaties that came years later.[140] International law was incorporated into space activities by Article III of the OST and by virtue of Article I and II, outer space is considered as *res communis*, a place not under any state but free for all states to explore. Consequently, no state can sanction another state or a private actor in relation to property right, because that would amount to claiming sovereignty in outer space.

Due to the lacunae in international law and the unresolved issues around property rights, private actors are left in the limbo as to the legality of the activities in outer space. This could portend serious consequences because of the huge and massive investments involved, for "some investors are reluctant to put their money in these ventures without some clarity as to whether that investment will be protected".[141] The United States and few other states have enacted national laws meant to address the fears of the private sectors. These laws were meant to grant some of the rights that the private sectors so much desire though the laws were craftily drafted to mask these rights.

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[139] Ibid, see Carl Schmitt, the Nomos of the Earth in the International Law of the Jus Publicum Europaeum (2003) 42-44; Ian Clark, Legitimacy in International Society (2005) 35-38; E. Tourme-Jouannet, 'The International Law of Recognition' (2013) 24 EUR, J. INT'L. L. 667 all cited by Blount.

[140] Ibid, at 107

[141] Ibid.