

Policing Mining: in outer-space
Greed and Domination vs. Peace and Equity
A governance for humanity!

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ABSTRACT

Staking claim and ownership has remained an antagonistic issue for nations, resulting in many international conflicts. This is particularly so in disputed territories or areas which are deemed the heritage of mankind. In the next 50-years mining in space is set to become a reality and rather than being used to become an asset to man/society and create an equitable world, it is likely to be a battleground for greed and sovereign dominance – an overspill from Earth.

This paper researches the conflict between greed and dominance vs. peace and equity in respect to space - mineral resources, providing historical contextualization, opinion, thoughts and interpretation. Hence, consideration is given to international approaches and who should ‘*police*,’ plus *the governance of*, space riches. The research largely considers the stance of the USA in this respect. The relevance of travel and travel modes (particularly air) and ownership of the sky is reviewed, so as to provide comparison and (historical) contextualization – identifying issues previously encountered when man looks to both travel and acquire assets by these means. The latest position of asteroid mining is also explored and ‘*lessons from Earth*’ are revisited as part of this research – which is largely considered and undertaken from a legal (discipline) perspective.

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1. Introduction

In June 2019, it was reported that the *asteroid-mining bubble had burst*.¹ With this, the prediction, and arguably goal, set by Eric Anderson, for extracting ice from asteroids near Earth by the mid-2020's was questioned as a highly improbable projection to be achieved.

There is little doubting that this report must be viewed as disappointing, not only to companies, such as *Planetary Resources* (co-founded by Anderson) but to the nation it was founded within – namely the United States of America (USA) (in this case) which was additionally set to prosper from any outer-space minerals, undertaken by its nationals or by the State.

On Friday 16 August, 2019 – some two months later, it was reported that President Trump made a bid to buy Greenland² – whilst this was met with some amusement worldwide – it is questionable as to whether there is more to this than appears on the surface? Could it be viewed as a nation trying to compensate for territory or property it had set its eye on?

The company *Planetary Resources*³ was set-up with the ambition to mine asteroids for minerals, water, metal and other valuable resources. Other co-founders, together with Anderson, were Lewicki – who had previously worked on Nasa Missions, and Diamandis – who was a well-known advocator of space-tourism.

Planetary Resources was financed by said - *visionaries*⁴ who were committed to expanding the world's resource base so that *humanity could continue to grow and prosper*. An honorable intention. However, it should also be borne in mind that the extraction of resources was valued at tens of billions of dollars annually, a massive commercial and economic boost to the USA economy. As Schmidt commented; “*The pursuit of resources drove the discovery of America and opened the West. The same drivers still hold true for opening the space frontier.*”⁵ It could therefore be questioned whether the admirable intent was the driving goal, or a meaningful or even convenient by-product that was used to mitigate the greed of the visionaries. Therein, justifying the staking of a claim to resources outside a nation. There is no doubting, as the author of this article acknowledged in 2016,⁶

¹ MIT Technology Review: How the asteroid-mining bubble burst – by Atossa Araxia Abrahamian, 26 June, 2019.

(Accessed Online at <https://www.technologyreview.com/s/613758/asteroid-mining-bubble-burst-history/> - 17 July 2019).

² BBC News. Greenland: Trump warned that island cannot be bought from Greenland. <https://www.bbc.com/news/world-us-canada-49367792> [Accessed on 16 August 2019]

³ Planetary Resources: <https://www.planetaryresources.com/company/timeline/> (Accessed 17 July 2019).

⁴ These included Google CEO Larry Page and Ross Perot, Jr. & Eric E. Schmidt.

K. Ram Shriram, Founder of Sherpalo, (Google Board of Directors founding member and Planetary Resources, Inc. investor) who is said to have seen the same potential in Planetary Resources as he did in the early days of Google.

Charles Simonyi, Chairman of Intentional Software Corporation and Planetary Resources, Inc. investor With company's advisers including film maker and explorer James Cameron; General T. Michael Moseley (Ret.); Sara Seager; Mark Sykes; and David Vaskevitch.

⁵ <https://www.planetaryresources.com/2012/04/asteroid-mining-plans-revealed-by-planetary-resources-inc/>

⁶ Fox, S. J., 2016. SPACE: The race for mineral rights. ‘*The sky is no longer the limit.*’ Lessons from Earth. *Resources Policy*. Vol. 49, September 2016, Pages 165-178.

that the USA were proactively bidding to claim property (albeit resources) outside their sovereign state.

It was not long after the newly founded company that, lobbying for the commercial space sector began in earnest in the USA which led to the controversial SPACE Bill being, rather quickly, taken through Congress and becoming an Act⁷ (Fox, 2016a⁸).

History has clearly shown us that an apolitical approach to mineral extraction is far from the norm, not only in space but also on earth, which humankind, as a species – regardless of nationality, collectively inhabits. There is little doubting that drawing manmade borders and boundaries across the world has led to a mentality of States competitiveness and nationalist supremacy. However, what approaches such as Planetary Resources and Mars One does show us, is a newer breed of pioneers comprising of non-governmental representation – backed by a nation (or nations) and an approach which arguably also clearly contravenes the spirit of international agreement and a peaceful accord – in line with an advocated global sustainable approach.

It is increasingly acknowledged that there is resources scarcity of some minerals exacerbated by an ever-increasing world population (Mancini & Sala, 2018; Tilton, 2003; Skinner, 2011). This drives up both competition and prices and, in parallel, also leads to the increased risk of security breaches in the supply chain (Dewulf et al., 2016; Graedel and Reck, 2016). At the same time, Mancini and Sala (2018) point out that the United Nations Sustainable Development Goals (UN-SDG's) are unlikely attainable without the contribution of minerals and metals. Yet, there is a degree of irony in this thought – whilst these resources are viewed as being essential to creating a sustainable world, which sees a more balanced and equitable existence for mankind – there is the converse being exhibited in terms of greed and domination by individuals, corporations and States. Given that International Law and related conventions and treaties predicate an approach to benefit all of humanity – it would appear that the attainment of the UN-SDG's may also be at an impasse.

This paper explores the conflict between greed and dominance vs. peace and equity in respect to mankind's heritage - mineral resources, against a backdrop of sovereign claims and ownership of so-called - *property* and *nations' rights*. Consideration, alongside opinion, reflection and interpretation, is given to international approaches and who should '*police*' disputed assets, plus *the governance* of earth and space riches; with the research, largely considering the approach of the USA in this respect. The relevance of travel and travel modes⁹ (specifically in the air, as well as by sea) are also reviewed, so as to provide comparison and (historical) contextualization – identifying issues previously encountered when man looks to both travel and acquire assets by these means.

⁷ HR 1508 - Space Resource Exploration and Utilization Act of 2015.

The Bill and subsequent Space Resource Exploration and Utilization Act (as within the 2015 - U.S. Commercial Space Launch Competitiveness Act),

⁸ Ibid.

⁹ In themselves users of extracted minerals – i.e. (scarce) fossil resources in the way of fuel.

The latest position of asteroid mining is further explored, towards the end of the paper and ‘*Lessons from Earth*’¹⁰ is revisited as part of this research – which is largely considered and undertaken from a legal (discipline) perspective.¹¹

2. Contextualization – An overview

2.1. Fast forward to space: looking upwards

Planetary Resources was founded on the recognition that there are over 16,000 asteroids near Earth that share a similar orbit to our planet. It was appreciated that asteroids contain the resources that are, in many instances, becoming scarce in the world we live in. Viewed from this perspective it would seem somewhat advantageous to the achievement of the SDG’s that we move upwards to staking a claim to the benefit of mankind in terms of our population’s collective well-being.

Space presents opportunities for us ‘all’ – and in terms of our past explorations upwards, the asteroids are said to be far more accessible than the moon or other planets we might reach or strive to reach – explore and arguably *conquer*. In terms of the latter, (conquering) - therein lies many of the conflicts *we – man*, has so often fallen foul of already on earth, in terms of seeking wealth to the detriment of others.

Arguably, signaling the intention and action to extract beyond the limits of Earth indicates the next phase of globalization (and conflict) - through ‘*asterization*,’ and, clearly calls into question – mankind’s rights vs. profit and commercialization.

As Schmidt said, ‘*the pursuit of resources drove the discovery of America*’ but in so doing, it also led to bloodshed and feuds over the claim to ownership of land that belonged to others.

The concept of a resource curse hypothesis is based on the premise that may well seem reversed in thinking – namely, that countries rich in natural resources tend to grow more slowly than resource-poor countries (Mikesell, 1997; Anderson, 1998; Sachs and Warner, 2001; Cai and Newth, 2013). However, it is no doubt more reasonable to conclude that powerful nations compete against each other in a race to secure these assets and in doing so actually increase their stakes to not only wealth but land and related property or assets.

The exploration, or arguably exploitation¹², of space has long been the pursuit of powerful nations with the 1950’s marking the space-war between the two superpowers of the USA and the then Soviet Union. While the 1960’s heralded the *new* leap, with the emergence of a *new* era of travel – namely, travelling into space, the 12 April 1961 marking man’s journey into outer space. The space race had begun. From this day forward there was set to be an increase of competition involving human space exploration. President John F. Kennedy’s bold, public statement that the USA would land a man on the moon before the end of that decade not only

¹⁰ The author would direct readers to her earlier publication within the journal with regards to a comparison of ‘*Lessons from Earth*.’ (Fox, S. J., 2016. SPACE: The race for mineral rights. ‘*The sky is no longer the limit*.’ *Lessons from Earth. Resources Policy*. Vol. 49, September 2016, Pages 165-178).

¹¹ As a lawyer it should be identified that law and a legal perspective also covers soft law (which is often referred to as policy) and also relates to opinion regarding interpretation of policy and law.

¹² See comments within Fox, S. J., 2016. SPACE: The race for mineral rights. ‘*The sky is no longer the limit*.’ *Lessons from Earth. Resources Policy*. Vol. 49, September 2016, Pages 165-178

involved technological dominance but a race for supremacy, space being viewed as a new frontier to conquer (Fox, 2016a).

When Neil Armstrong stepped onto the moon in 1969, the conflict between victory of mankind vs. victory of a nation were only too clearly displayed. While Armstrong's commentary acknowledged the consequences of the event as, '*one small step for man, one giant leap for mankind,*' the physical actions of prominently planting the USA flag on the moon – only too clearly pointed to the nation's dominance. History has always recorded the fact that nothing speaks louder in terms of a nation declaring itself as victorious and staking a claim than the symbolic gesture of marking the ground with a related national token. The 1957 article from the USA called '*Let's Claim the Moon - Now!*' reinforced this concept referring to the similarities of this act with the actions of Columbus claiming territory on behalf of a nation – when it stated; '*Columbus stuck the Spanish Flag into the sands of a West Indies beach - and we or the Russians would be perfectly within the concept of international law to claim possession of the Moon....*'¹³

When Armstrong stepped onto the moon there was no specific agreement governing the moon, in isolation, at this time; however, the Outer Space Treaty was applicable in terms of the identifying conduct which was deemed ill-appropriate – this included ***national appropriation by claim of sovereignty***. Hence, the possibility of 'claiming the moon' contrary to the earlier (1957 publication) was prohibited by International Law.

2.1.1. *Space Law Treaties and Principles – lessons from early space exploration*

The Committee on the Peaceful Uses of Outer Space (COPUOS) was set up by the UN General Assembly in 1959 to '*govern*' the exploration and use of space. No doubt lessons from Earth indicating that there was the risk of abuse and exploitation from various nations. From this perspective, the Committee should be viewed as the governance system for space development. The rationale for the Committee was said to ensure that the utilization of space was *for the benefit of all humanity: for peace, security and development*.

The Committee was tasked with reviewing international cooperation so as to ensure peaceful uses of outer space.¹⁴ One of the identified remits, from the start, related to the study of legal problems arising from the exploration of outer space.

To date, the Committee has concluded five international treaties¹⁵ and five sets of principles on space-related activities. However, that said, the status of each of the respective treaties remains inconsistent¹⁶ (see Table 1).

The five treaties (commonly collectively referred to as the five United Nations treaties on outer space) are:

- The "Outer Space Treaty"¹⁷ (OST) opened for signature on 27 January 1967, entered into force on 10 October 1967

¹³ Huss. Let's Claim the Moon -- Now! *Mechanix Illustrated*, Feb. - Mar. 1957, at 7.2

¹⁴ As part of a peaceful approach - the emphasis then was also on prohibiting the use of space for military purposes and the placement of weapons of mass destruction in outer space.

¹⁵ In relation to this research, comment will be made specifically in relation to the first and last Treaties – namely the Outer Space Treaty and the Moon Agreement.

¹⁶ See footnote 22.

¹⁷ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. Adopted by the General Assembly in its resolution 2222 (XXI).

- The "Rescue Agreement"¹⁸ (RA) opened for signature on 22 April 1968, entered into force on 3 December 1968
- The "Liability Convention"¹⁹ (LC) opened for signature on 29 March 1972, entered into force on 1 September 1972
- The "Registration Convention"²⁰ (RC) opened for signature on 14 January 1975, entered into force on 15 September 1976
- The "Moon Agreement"²¹ (MA) opened for signature on 18 December 1979, entered into force on 11 July 1984.

TREATY	Ratification, acceptance, approval accession or succession²²	Total signature	Declaration of acceptance of rights and obligations
OST	109	23	0
RA	98	23	2
LC	96	19	3
RC	69	3	3
MA	18	4	0

Table 1: Status of International Agreements relating to activities in outer space as at 1 January 2019²³

The Committee is also tasked with ensuring International cooperation in space through the exploration and the use of space technology applications to meet global development goals, aspects which are discussed yearly by the Committee.

¹⁸ Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space. Adopted by the General Assembly in its resolution 2345 (XXII).

¹⁹ Convention on International Liability for Damage Caused by Space Objects. Adopted by the General Assembly in its resolution 2777 (XXVI).

²⁰ Convention on Registration of Objects Launched into Outer Space. Adopted by the General Assembly in its resolution 3235 (XXIX).

²¹ Agreement Governing the Activities of States on the Moon and Other Celestial Bodies Adopted by the General Assembly in its resolution 34/68.

²² The ratification, acceptance, approval accession or succession has risen slightly since the author last accessed this data [Accessed 26 September, 2015] – as within, Fox, S. J., 2016. SPACE: The race for mineral rights. ‘*The sky is no longer the limit.*’ Lessons from Earth. *Resources Policy*. Vol. 49, September 2016, Pages 165-178.

TREATY	Ratification, acceptance, approval accession or succession
OST	103
RA	94
LC	92
RC	62
MA	16

²³ Data from United Nations – Office for Outer Space Affairs [Accessed 18, August 2015]. Committee on the Peaceful Uses of Outer Space. Legal Subcommittee Fifty-eighth session Vienna, 1–12 April 2019. A/AC.105/C.2/2019/CRP.3

It is the Outer Space Treaty which provides the basic framework on international space law, noting that the full title refers to “*governing the Activities of States in the Exploration and Use of Outer Space*” which includes “*the Moon and Other Celestial Bodies*.”

The Outer Space Treaty was considered by the Legal Subcommittee in 1966 and agreement was reached in the General Assembly in the same year. The Treaty was largely based on the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, which had been adopted by the General Assembly.²⁴ The Treaty was opened for signature by the three depository Governments (the Russian Federation, the United Kingdom and the United States of America) in January 1967, entering into force in October 1967.

The OST outlines the following principles:

- *“the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind;*
- *outer space shall be free for exploration and use by all States;*
- *outer space is not subject to **national appropriation by claim of sovereignty**, by means of use or occupation, or by any other means;*
- *States shall not place nuclear weapons or other weapons of mass destruction in orbit or on celestial bodies or station them in outer space in any other manner;*
- *the Moon and other celestial bodies shall be used exclusively for peaceful purposes;*
- *astronauts shall be regarded as the envoys of mankind;*
- *States shall be responsible for national space activities whether carried out by governmental or non-governmental entities;*
- *States shall be liable for damage caused by their space objects; and*
- *States shall avoid harmful contamination of space and celestial bodies.*”

The Moon Agreement came sometime after man had landed on the moon. It reinforces the fact that law and agreements are rarely pro-active but responsive. The need and contents for the Moon Agreement were considered and elaborated on by the Legal Subcommittee from 1972 to 1979. The Agreement was adopted by the General Assembly in 1979.²⁵ However, it was not until June 1984, that the fifth country, Austria, ratified the Agreement, allowing it to enter into force in July 1984. This reinforces some of the difficulties of International Law – which are to be discussed further below, in terms of providing the adequate means to govern mankind’s resource assets.

The subsequent Agreement reaffirms and elaborates on many of the provisions of the Outer Space Treaty as applied to the Moon and other celestial bodies, reinforcing the principle that those bodies should be used exclusively for peaceful purposes and that their environments should not be disrupted. It requires that the United Nations should be informed of the location and purpose of any station established on those bodies.

In addition, the Agreement provides that the Moon and its natural resources are the common heritage of mankind and that an international regime should be established to govern the exploitation of such resources when such exploitation is about to become feasible.

²⁴See [resolution 1962 \(XVIII\)](#) in 1963 (with a few new treaty provisions added).

²⁵ In [resolution 34/68](#).

There can be little doubting that the extraction of minerals and other resources is feasible now and from this perspective lessons should be learnt in terms of the need to be proactive today and ensure that provisions are in place to govern issues which will inevitably arise. We only have to look to earth to see evidence of this.²⁶

Peter Diamandis (Planetary Resources) in stressing the wealth in space commented;

“Everything we hold of value on this planet, metals, minerals, real estate, energy sources, fuel—the things we fight wars over—are literally in near infinite quantities in the solar system.”²⁷

So, whilst this may offer some reassurances in terms of the forecast we are unlikely to run out of minerals and other precious resources, the risk lies in the fact that far from meeting the SDG’s (through having these available to us²⁸) we will most likely see conflicts and wars – especially if we fail to secure now an adequate governance system to allow equitable exploration and not individual, corporate or State exploitation.

3. Down on Earth: Policing society (a reflective glance)

‘Policing’ refers to a duty to maintain law and order, to keep the peace, to keep society safe and safe-guard citizens and their rights.

The origins are from the medieval Latin, and later French – ‘*politia*’ referring to citizenship and government and therefore a system/form of governance to control and regulate. This is not to be confused with the police (an organization) which is a derivation from the same origins but relates to a more arguably limited approach undertaken by a force (which arose later on – arguably after the 15th century).

Reference is also made to the fact that *policing* involves the enforcement of regulations or an agreement.²⁹ While the Cambridge Dictionary gives examples to illustrate where policing is applied i.e. to ‘policing’ battles over borders and sovereignty.³⁰

3.1. Evolution of society

Over 100,000 years ago, modern humans began surveying the earth, spending their days in a nomadic existence, seeking out resources – such as food and water.³¹ And, so began the early quest for nutrients and hence, minerals and other resources too.³² Given the population at that time and the lack of mobility, particularly, in the form of motorized transportation – individuals and groups rarely encountered others, particularly from different areas.³³

²⁶ As evidenced in a comparison study within the earlier research paper published in Resources Policy. Fox, S. J., 2016(a). SPACE: The race for mineral rights. ‘*The sky is no longer the limit.*’ Lessons from Earth. *Resources Policy*. Vol. 49, September 2016, Pages 165-17.

²⁷ In a speech in 2013.

Commented on in The New Republic - <https://newrepublic.com/article/117815/space-mining-will-not-solve-earths-conflict-over-natural-resources>.

²⁸ Mancini & Sala, 2018.

²⁹ Oxford Dictionary (Lexico-online).

³⁰ <https://dictionary.cambridge.org/dictionary/english/policing> [Accessed 18 August, 2019].

³¹ Carter, P., 1987. *The road to Botany Bay*. London: Faber & Faber.

³² Smithsonian National Museum of Natural History, Human Origins Program, at

<http://www.mnh.si.edu/anthro/humanorigins/faq/Encarta/encarta.htm>

³³ Ibid.

Although as Buxton (2004) points out, “*one might imagine early confrontations laced with friction and unease,*” when this did occur. Thus, indicating an early tendency to stake a claim— albeit, in this, case food and water; and, an aggressive nature towards protectionism to possessions. Resources were in abundance, although the means to claim them and the wealth of such, were both not available and understood. In many ways, mans’ greed could be said to have been the driving force.

Through time, man began to settle – land was farmed, and waters were fished. With this, land, both close-by and further afield, was conquered in terms of both development and acquisition. Artificially, in many regards, we had begun to draw lines across the earth to mark and control territory. And, with regards to the sea, that had so frequently been used to facilitate the access and ability to claim far-off land, rights, utilization and ownership also became contentious in terms of access, use and even ownership-claims (Fox, 2016a³⁴).

The use of transport has been a key factor in the evolution and civilization of man and the conquering of new territories. The concept being that the strongest army won the land, took the territory and claimed it by planting their flag to show ownership and control. Advancing technology has led to the development and use of more sophisticated transportation systems – themselves being powered by earth’s resources. However, linked to this – in the form of a symbiotic consequence – has come greater possession disputes by both individuals and States (which have often been settled by the use of advancing transport modes – e.g. tanks, submarines, battle ships and airplanes).

As Buxton remarked, “*from the beginning of time, civilizations intelligent or fortunate enough to make use of resources within their reach excelled and dominated. Man intuitively exploit[ing] natural resources.*”

3.1.1. Borders – boundaries and sovereignty

The act of movement has had an influential role to play in causing boundaries themselves to be defined or re-defined. Rubenstein (2001) remarked, that “*the function of a boundary is to produce and regulate a distinction between inside and outside; the movement of things across a boundary signals not its failure but its success.*” Clifford (1997) and Rubenstein (2001) actually point to the fact that mankind recognizes a border and boundary only when it is essentially crossed – or when failure results by the act of intended act of doing so. In this sense, the phrases to ‘*cross the line*’ or ‘*overstep bounds or borders*’ are often used to show our distaste and dislike for an act. Historically, many a war has been fought over the overstepping of a boundary or an action which is seen or perceived as hostile – particularly in someone else’s area or territory. Whilst, the success of crossing a boundary is only recognized and measured when something positive has been achieved and normally when there is an advantage to someone, frequently a nation or nations, by the sharing of commodities through trading and hence an advancement of wealth.

Steinberg (2009) has made reference to the rationale that theorists, within the geopolitics environment, increasingly recognize that boundaries are more than simply lines that outline territories. There is a direct correlation between a ‘boundable space’/ territory and the

³⁴ Also referring to Parry, J. C., 1974. *The discovery of the sea*. New York: Dial within.

Biagini, E and Hoyle, B., 1999. Insularity and development on an oceanic planet. In *Insularity and development: International perspectives on islands*, ed. E. Biagini and B. Hoyle, 1-14. London: Pinter.

Bender, T., 2006. *A nation among nations: America’s place in world history*. Boston: Hill& Wang.

utilization of the area as a means of travel as well as to conquer and to claim.³⁵ Ownership of the physical land extends way beyond what the eye is able to see; and, this is perhaps more obvious when this is considered in respect to defining land as space (including above and below); or, the space of (above and below) the sea; or, the even the higher space which is viewed as another dimension of an area above and beyond the planet.

Ownership of the sea and air has equally proven problematic and is closely linked to sovereignty claims and disputes (Fox, 2016a & b, & 2018). In this respect it should be easy to conclude that future development and exploration of space would be any less contentious.

According to Black's Law Dictionary,³⁶ sovereignty is defined, inter alia, as a supreme political authority which entails "*the international independence of a state, combined with the right and power of regulating its internal affairs without foreign dictation.*"³⁷

The concept of sovereignty stems back to the signing of the Peace of Westphalia Treaty in 1648,³⁸ which ended a 30-year religious war in Europe. It is generally recognized by scholars that the origin of the principle of sovereignty can be found in this treaty, although arguably sovereignty itself is not clearly defined in the texts.³⁹

The Treaty however establishes three core ideologies:

- The principle of State sovereignty;
- The principle of (legal) equality of States;
- The principle of non-intervention of one State in the international affairs of another.

In essence, the philosophy was based upon a presumption that independence and isolation of each State would actually prevent future wars.⁴⁰

However, in contrast the isolation of nations has also led to conflict, distrust and competitiveness. The 1960's space race grew from the Cold War which was a containment of suspicion (held within the USSR boundary and arguably the USA internal borders) - in terms of a perceived threatening environment which had the potential to manifest through outward aggressive actions.⁴¹ This same distrust ultimately leads to competitive behavior and the determination to exert a show of force and supremacy in other ways. These behaviors have

³⁵ Fox (2016) also referring to Brotton, J., 1998. *Trading territories: Mapping the early modern world*. Ithaca, NY: Cornell University Press.

Steinberg, P., 1999. The maritime mystique: Sustainable development, capital mobility and nostalgia in the world ocean. *Environment and Planning D: Society & Space*. (17) 403-26

Gillis, J. R., 2007. Islands in the making of an Atlantic Oceania, 1500-1800. In *Seascapes: Maritime histories, littoral cultures, and transoceanic exchanges*, ed J. H. Bentley, R. Bridenthal, and K. Wigen, 21-37. Honolulu: University of Hawai'i Press

³⁶ Henry Black, Black's Law Dictionary (2d ed., The Lawbook Exchange Ltd. 1995).

³⁷ *Ibid.*

³⁸ Peace Treaty between the Holy Roman Emperor and the King of France and their Respective Allies, Oct. 24, 1648 [hereinafter Treaty of Westphalia], http://avalon.law.yale.edu/17th_century/westphal.asp.

³⁹ Croxton, D., 1999. *The Peace of Westphalia of 1648 and the Origins of Sovereignty*, 21 Int'l Hist. Rev. 569, 569. <http://dx.doi.org/10.1080/07075332.1999.9640869>.

⁴⁰ Fox, S. J., 2016. BREXIT: A bolt from the blue! – *Red sky in the morning? Issues in Aviation Law and Policy*. Volume 16, No. 1. Autumn, 2016, pp 83-119.

Also see Engle, E., 2004. *The Transformation of the International Legal System: The Post-Westphalian Legal Order*, 23 Quinnipiac L. Rev. 23, 24.

⁴¹ Chilton, P. A., 1996. *Security metaphors: Cold war discourse from containment to common house*. New York: Peter Lang.

been exhibited across the globe in terms of supremacy, staking a claim and ultimately greed related to assets on the Earth (for example the sea and the Antarctic region⁴²).

Politics is therefore intertwined in this complex equation of sovereignty and ownership – manifesting itself not only in dominance but prosperity too.

4. International Law

Sovereignty in domestic law is the power of a government to rule without other countries or outside forces intruding. International law largely recognizes this philosophy - that is, that each nation-state has sovereignty over its territory and domestic affairs. This, therefore, in the main excludes the interference of external powers, the principle of non-interference in another country's domestic affairs, while also recognizing the principle that every State (regardless of size) is equal in international law. This concept, within a recognized legal system, ultimately became “the cornerstone of the modern system of international relations,”⁴³ whereby, the current system of states has become the established “dominant world order framework” (Falk, 1998).

4.1. UN and International Law

International Law continues to change and adapt. The UN is relatively young in this equation, although International law is now a primary concern of the United Nations.

The foundations of the UN lie in the League of Nations. With many of the concepts being first expressed by the then USA President Woodrow Wilson's '*Peace without Victory*' in 1917. His speech to Congress (22 January⁴⁴) referred to several interesting aspects connected to the freedom of travel and equality across the globe:

- He referred firstly to the fact that, “[t]he equality of nations upon which peace must be founded if it is to last must be an equality of rights.” He clarified his rationale and continued by referring to the sea.
- Then, he reinforced his belief that, “the paths of the sea must alike in law and in fact be free. The freedom of the seas is the sine qua non of peace, equality, and cooperation.”
- He referred to “a somewhat radical reconsideration of many of the rules of international practice hitherto thought to be established may be necessary in order to make the seas indeed free and common in practically all circumstances for the use of mankind....”
- And, stated that there was compelling reasons for advocating and securing “the freedom of the seas”, which could be achieved “*if the governments of the world sincerely desire[d] to come to an agreement concerning it*”.

President Wilson's speech, although concerning freedom of passage of the sea, spoke of liberalization and equality of access; and yet, on the European continent States were bitterly involved in a war (World War I) which not only included fighting on the land but also saw

⁴² Further explored in Fox (2016a).

⁴³ Holsti. K. J., 1991. *Peace and War: Armed Conflicts and International Order*. See also the 350th anniversary of the Peace of Westphalia: Bussmann, K. and Schilling, H (eds), 1998. *1648: War and Peace in Europe*. Vol. 1.

⁴⁴ Wilson, W. (1917) *Peace without Victory Speech to Congress, 22 January 1917* [online] <http://www.firstworldwar.com/source/peacewithoutvictory.htm>

battles to protect the air space above their territory, reinforcing the concept of air space with sovereign control.

The Paris Peace Conference formally ended the war and led to the eventual drawing up of the League of Nations. Wilson staunchly supported the idea of a League to maintain world peace. However, as Milde (2012) identified the League of Nations suffered the fate of the entire ‘Versailles’ peace system, notably because the USA failed to ratify the Versailles Treaty and join the League of Nations, which invariably weakened the League.

It was to be another war (World War II) that led to the eventual forming of the UN. The idea first being discussed during a conference held at Dumbarton Oaks in Washington, D.C. between 21 September 1944 through to 7 October 1944. A year later, in 1945, representatives of a number of nations met in San Francisco at the UN Conference on International Organisation to draw up the UN. The Charter was signed on 26 June 1945 by the representatives of the 50 countries represented.⁴⁵

The founding principles and purpose was peace; with Article 1.1. stating the intention as:

“To *maintain international peace and security*, and to that end: to take effective *collective measures for the prevention and removal of threats to the peace*, and for the suppression of acts of aggression or other breaches of the peace, and to bring about by peaceful means, and *in conformity with the principles of justice and international law*, *adjustment or settlement of international disputes or situations* which might lead to a breach of the peace.....”

Parallel talks were held (in 1944) addressing the need to amend the international aviation framework – this later transpired through a new *Chicago Convention*⁴⁶ and led to the establishment of the International Civil Aviation Organization, a specialized agency of the UN to govern civil aviation and travel across nations territories.

Ideally, a unified system approach, in the form of internationally agreed laws (conventions and treaties) serves as a mechanism to prevent and minimize conflicts, both from a physical and legislative perspective. From a legal stance, international law provides a mechanism to replace the disparity that exists regarding substantive law and jurisdiction, clarifying mutual rights and obligations whilst providing clarity to all (Fox, 2015b & 2017).

4.2. Limitation of International Law and international governance

Despite the intention of international law, and how the UN views itself, namely, as the “*world’s only truly universal global organization, the foremost forum to address issues that transcend national boundaries and cannot be resolved by any one country acting alone*,”⁴⁷ there are obvious limitations. Not least political willingness to join and be part of an international organization as well as the various international treaties and conventions. Reference to the forerunner – the League of Nations only too clearly reinforces this concept.

⁴⁵ The UN officially came into existence on 24 October 1945.

⁴⁶ Convention on International Civil Aviation, *opened for signature* Dec. 7, 1944, 61 Stat. 1180, 15 U.N.T.S. 295 (entered into force Apr. 4, 1947) [hereinafter Chicago Convention].

⁴⁷ <https://www.un.org/en/essential-un/> [Accessed 20 August 2019].

National sovereignty is still very much protected and held sacrosanct. Policing the skies (and, the seas) has often proved a challenge. In respect to the air, from an aviation context, the Chicago Convention adheres to the principle of State sovereignty by recognizing this concept. And hence aviation continues to battle an archaic legacy inextricably linked to sovereign protectionism and ownership of a “national asset” – a throwback undoubtedly linked to its wartime origins (the Chicago Convention).⁴⁸ Hence, it is left to individual States to mutually exchange reciprocal commercial rights, with Article 6 providing that “[n]o scheduled international air service may be operated over or into the territory of a contracting State, except with the special permission or other authorization of that State, and in accordance with the terms of such permission or authorization.”⁴⁹

The so-called “nationality clause”⁵⁰ has, as a consequence, become embedded in most bilateral air service agreements, also due to “restrictive” government thinking, which has, for the most part, not become more progressive over time. Article 1 of the Convention, recognizes and reinforces from the outset that each contracting State has complete and exclusive sovereignty over the airspace above its territory. Article 2 defines “territory” by stating that it “shall be deemed to be the land areas and territorial waters adjacent thereto under the sovereignty, suzerainty, protection or mandate of such State,” thus, reinforcing the linkage back to another transport: maritime transport and Laws of the Sea (Fox, 2015a).

Hence, one of the fundamental limitations or failure of International Law therefore is that nations are only bound by law through their consent and hence advancements can only occur when there is willingness to do so. And, as Arend (1999) reaffirms, “[i]n the absence of a law... they are legally allowed to do as they choose.” Successful implementation, consequently, means that States have to be *willing* to formulate, accept, and adhere to practices and international laws. Inevitably, this remains a clear challenge and a weakness of international law, not least when this conflicts with sovereignty, supremacy and wealth.

That said, in terms of the original understanding of the Westphalian Treaty, arguably a more modernist view did start to emerge in the 1960’s – no doubt interconnected to space exploration – which was based upon a new, post-Westphalian doctrine of the international community, namely that globalization had made the old approach anachronistic.⁵¹ In this respect, there was appreciation of the fact that no nation was bound by any legal framework in regards to ownership of space. And, hence there was the opportunity to apply a spirit in line with international law in terms of recognizing a common heritage principle⁵² (the very ethos described by President Wilson); namely, that assets could belong to mankind and not to a nation – hence the irony of Armstrong’s words compared with his very visual actions.

5. Space – *the final frontier*

⁴⁸ Fox, S. J., 2015(a). *CONTEST’ing Chicago Origins and Reflections: Lest We Forget!*, 8 Int’l J. Private L. 73–98.

⁴⁹ Art. 6. Chicago Convention.

⁵⁰ See ICAO Secretariat, *Liberalization of Air Carrier Ownership and Control 1*, (ICAO, Working Paper No. ATConf/6-WP/12, 2012).

⁵¹ See Fowler, M. R. & Bunck, J. M., 1995. *Law, Power, and the Sovereign State: The Evolution and Application of the Concept of Sovereignty 2*.

⁵² This was the same as was applied to the seabed and ocean floor in the 1970’s after extensive years of discussions, when the UN Assembly unanimously declared these areas were beyond the limits of national jurisdiction and held it to be the common heritage of mankind.

Defining what is meant by space is itself contentious, as Fox previously discussed (2016a). The phrase ‘the edge of space’⁵³ is often used to mark the ending of airspace and the beginning of outer space and is based upon the work of Theodore von Kármán,⁵⁴ which the Kármán line is named after.⁵⁵ This lies at an altitude of 100 kilometers (62 miles) above the Earth's sea level, and is said to be the boundary between the Earth's atmosphere and outer space. This definition is recognized by the Fédération Aéronautique Internationale (FAI).⁵⁶ That said, any suggested definition remains merely a benchmark in lieu of international agreement.⁵⁷ It should be identified that when the height increases it invariably remains questionable as to what can actually be claimed under sovereign ownership, since arguably, as the earth rotates, the airspace above a country is only relative - meaning there is no fixed point above it for which to claim sovereignty over.

The same uncertainty therefore is magnified in terms of outer-space and the height that this extends to. The vertical limit has not been specified within International treaties and conventions, meaning the delimitation of airspace and outer space is still unclear. While, there may be no disputes registered on this issue, with Milde (2012) expressing the view that a pragmatist would state that this has no practical relevance ‘at present,’ given the disputes that have occurred on Earth relating to land/territory, property (including resources) and ownership claims, a realist would identify that this is a mistake by the international community.

There can be little doubting that a number of issues will occur, and it is essential that a proactive approach be taken; particularly given that:

- The UN Committee (COPUOS) was tasked with reviewing international cooperation so as to ensure peaceful uses of outer space, with one of the identified remits, stating there was a need to study legal problems arising from the exploration of outer space (see 2.1.1. of this paper). And,
- That the Moon Agreement provided that an international regime should be established to govern the exploitation of such resources when such exploitation ‘*is about to become feasible*’. (Also at 2.1.1.).

Even when there have been treaties relating to space, there has been criticism levied at the ambiguity of such. The Outer Space Treaty (OST) in particular has raised concerns. Listner (an attorney and founder of a think tanks for Space Law and policy) has identified, that the “*debate isn’t about what it says. It’s about what we want it to say.*”⁵⁸

The crucial aspect therefore also remains, as to what would qualify as national appropriation in space? And if nations would really be bound by a decision to clarify this?

The Moon Agreement aimed to address aspects of inequality. During discussions some States

⁵³ A long over-due tribute to an elite group of Dryden research pilots.

http://www.nasa.gov/centers/dryden/news/X-Press/stories/2005/102105_Wings.html

⁵⁴ A Hungarian physicist and engineer.

⁵⁵ See further details on the Kármán line at <http://www.fai.org/icare-records/100km-altitude-boundary-for-astronautics>

⁵⁶ <http://www.fai.org/icare-about-us>

⁵⁷ Jasani, B., (ed.), 1991. *Outer Space: A Source of Conflict or Cooperation?* United Nations University Press, Tokyo. Pp.7-8.

⁵⁸ Cited in Axios.Com: Comment by Erin Ross ‘Who owns space?’ 19 October, 2017.

<https://www.axios.com/who-owns-space-1513306283-6e97b6e6-c75e-40c1-99ae-2b8fe5c505b5.html> [Accessed 21 August, 2019].

advocated that nations that could not afford to go to space should also benefit from the sharing of wealth, whilst others advocated the sharing of intellectual property rights in respect to technology enabling space-travel and mining. In the end the USA, Russia and China (the very nations' most likely at the time to go to the moon) chose not to sign the Treaty, and to date have not done so.⁵⁹

At the moment, there remains no consensus as to the legality of protecting space resources and to sharing these for the good of humanity. And, therefore, it is debatably whether claiming ownership of space, and particularly minerals, is ever going to translate to being viewed as successful (total or otherwise) for mankind. The truer potential is that the extraction of minerals and space mining will, in the short-term at least, lead to conflict and discourse.

Without clarity the economic (greed) and opportunistic perspective will prevail (no doubt led by nations). So, whilst Peter Diamandis (Planetary Resources) may also identify that, humanity has a “moral obligation to become an interplanetary species,” and, that if, (or rather, when) we harness the resources in space, “the entire human race will be the beneficiary;”⁶⁰ without international agreement being reached this will not occur. It could even transpire that space could become the final frontier for mankind and/or the battleground wealth acquisition and supremacy.

5.1. Staking a claim to space-wealth

Mankind has already demonstrated as part of its evolution the tendency to exploit resources.⁶¹ Unlike the MA (Moon Agreement) the USA has ratified the OST. In this regard, it is stated that Contracting States take responsibility for compliance of a treaty, however, the depth of this responsibility is questionable. When activities are undertaken by government or national bodies then the assumption is that the State assumes responsibility as the signatory, and, if an activity is undertaken by an international body then that organization assumes the responsibility.⁶² However, the current debate also concerns whether or not corporations and individuals can extract resources and the liability that rests with any State government where the company of individual is incorporated and/or resident.

Article II specifically refers to sovereignty claims; and, in 1969, Professor Gorove⁶³ cast doubt on whether any claim by sovereignty related to private parties at all. This said, sovereignty remains a nation's right to exert exclusive authority over its citizens, and arguably therefore over resources and national bodies, etc., not only within the State, but at

⁵⁹ Comment was previously passed on by the author, Fox (Fox, S. J., 2016. SPACE: The race for mineral rights. *'The sky is no longer the limit.'* Lessons from Earth. *Resources Policy*. Vol. 49, September 2016, Pages 165-178) that the USA is not a signatory to the United Nations Convention on the Law of the Sea (UNCLOS - Signed on 10 December 1982 in Montego Bay Jamaica, entering into force on 16 November 1994. UN Treaty Series, Volume 1833, p.3.)

See list of signatories – UN Treaty Collection
https://treaties.un.org/pages/ViewDetailsIII.aspx?src=TREATY&mtdsg_no=XXI-6&chapter=21&Temp=mtdsg3&lang=en

⁶⁰ In a speech in 2013.

Commented on in The New Republic - <https://newrepublic.com/article/117815/space-mining-will-not-solve-earths-conflict-over-natural-resources>.

⁶¹ Buxton at 3.1.

⁶² Title VI OST.

⁶³ Gorove. S., 1969. Interpreting Article II of the Outer Space Treaty, 37 *Fordham L. Rev.* 349, pp. 351.

times external to it – (for example, the retention of jurisdiction over other transport modes (ships and aircraft). However, this interpretation will no doubt remain significant to determine, ‘if/when’ private companies pursue mining on/from celestial bodies.

In 2015 (in the absence of international law or global consensus) the USA passed a law⁶⁴ relating to the pursuit of the *commercial exploitation* of space.⁶⁵ The final Act was to contain a disclaimer (which was initially missing from the Bill) in terms of stating, in relation to Extraterritorial Sovereignty, that ‘*It is the sense of Congress that by the enactment of this Act, the United States does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body*’ (Sec. 403). No doubt this disclaimer was added in recognition to the potential international concerns and dissonance. However, it still failed to address just how much the USA was purporting (or not) that it would govern (or assume) property rights of resources. This remains arguably dangerous territory. For, it could lead to, or be perceived as, taking a ‘degree’ of ownership and sovereignty control over celestial bodies by the mere enactment of this Act. With even the interpretations of celestial bodies up for debate.

It also calls into question whether the USA would look to prevent other nations mining the same asteroid/celestial body as its own national’s are mining? In other words, could it still be, metaphorically, planting the U.S. flag on anything seen as lucrative and worthy of exploiting, in the name of the USA?

Perhaps interesting, in this respect, is the Hearing before the USA Senate Subcommittee on Space, Science and Competitiveness and the testimonies that occurred on 23 May, 2017. Peter Marquez clearly identifying, during this testimony, that the international community is still trying to fathom out how to interpret the OST whilst the USA was now turning to Title IV of the Commercial Space Launch and Competitiveness Act (CSLCA) which recognizes the legal right to own resources extracted from asteroids, as he said, “*in full accordance with international law.*” Adding however, that his company (Planetary Resources) “*strongly thanks the Senate, and specifically, this Committee’s Members and staff in developing and passing this law.*” He further added the USA “consistency” in interpreting the OST “*in a manner that promotes innovative, ground-breaking commercial space activities.*” Or, in other words, national revenue – ‘*commercial*’ here again, being the operative word. Marquez, whilst stating that space is a global endeavor identified the “profound national-level implications” expressing ‘*concern*’ that opening up the OST would be to “the detriment of national and international security.” And perhaps, more significantly, as he also identified, will leave his specific “*industry worse off*” – financially.

His final comments related to continued success in “U.S. engagement” including working with international partners and “*to interpret[ing] and apply[ing] the Outer Space Treaty to evolving circumstances, and the continued support of the Congress in developing timely domestic legislation....*”

⁶⁴ HR 2262 U.S. Commercial Space Launch Competitiveness Act: 11/25/2015 Became Public Law No: 114-90.

⁶⁵ Discussed at lengths in Fox, S. J., 2016. SPACE: The race for mineral rights. ‘*The sky is no longer the limit.*’ Lessons from Earth. *Resources Policy*. Vol. 49, September 2016, Pages 165-178.

Since this time the somewhat smaller country of Luxembourg has followed suit.⁶⁶ On 13 July, 2017 the Luxembourg Chamber of Deputies passed a law regarding the exploration and utilization of space resources.⁶⁷ This marked the second country in the world to have such legislation and therefore the first European country to have a legal framework recognising the right to extraction of resources. It thus further emphasizes the inability from an international perspective for the UN to address this growing opportunity for individual nations.

On the 10 May, 2019, The Grand Duchy of Luxembourg and the United States of America signed a memorandum of understanding (MoU) which is said to serve to catalyze and significantly deepen cooperation between the two countries in the field of space (extending therefore beyond mining resources).

The MOU is said to provide the means to establish a more formal dialogue, including the sharing of expertise and exchange of information between Luxembourg and USA. The idea is to promote the continued growth of their respective space industries through new commercial and investment opportunities, as well as to strengthen policy coordination of their two respective regulatory framework – which are said to be “business-friendly.” It also aims to identify and strengthen collaboration in other projects of common interest, for example, in the fields of civil space exploration, science, earth observation, space situational awareness and communications. The MoU, therefore, enables further research, exploration, development, and use of space, not only by the two countries governments, but also by research institutes and private sector space companies.

5.2. What lies above: estimating the assets

The orbit paths of some near-Earth asteroids (NEAs) bring them to within around 30 million miles. Accessing and mining or extracting the valuable commodities will not be cheap and is likely to involve the use of an outer-space drone: a small telescope-equipped spacecraft, that will initially survey the NEA’s. Once an asteroid is determined to be valuable, the extraction could begin, though this, in itself, introduces further technical obstacles. It is anticipated that some modified version of terrestrial mining, like drilling or magnetic separation, could be used for the operation. However, sources have identified further risks in the operations. Not least, the fact that tampering and drilling into an asteroid could affect the speed and direction it is flying in. In a worst-case scenario, it has been said that unintentionally it could be re-direct towards earth.⁶⁸ Or, even intentionally explored as a means to cause destruction to our planet – hence, another, potential security threat.

5.2.1. So is it worth it?

During Peter Marquez’s testimony⁶⁹ he referred to one of his company’s key targets when mining in space identifying the wealth of the platinum group of metals. While being extremely rare on Earth, there is a near limitless supply on asteroids – citing the fact that a single 500-meter platinum rich asteroid contains 175 times the global annual output of

⁶⁶ It is reported that Luxembourg has registered 10 space-mining companies since 2016, with some targeting the Moon, and others eyeing near-Earth asteroids for mining: <https://oilprice.com/Energy/Energy-General/The-Golden-Asteroid-Worth-700-Quintillion.html> [Accessed 19 August, 2019].

⁶⁷ This entered into force on 1 August, 2017.

⁶⁸ Dr Natalie Starkey, a cosmochemist and science author, discussed the threat of mining asteroids on the StarTalk science podcast. As reported in the Express Newspaper. Asteroid danger: Mining asteroids for their rare metals could send them straight at Earth. <https://www.express.co.uk/news/science/1161714/Asteroid-danger-mining-asteroids-rare-metal-send-asteroid-Earth-impact> Published: 15:56, Mon, Aug 5, 2019. [Accessed 18 August, 2019]

⁶⁹ USA Senate Subcommittee on Space, Science and Competitiveness - 23 May, 2017

platinum or 1.5 times the globally recognized platinum reserves. And, a recent report estimates that an asteroid worth \$700 quintillion in precious heavy metals has been identified.⁷⁰

With this comes the race to capitalize on the resources above us, with predictions stating that space will witness a 21st Century gold, or resource rush. Estimates however fluctuate enormously, as to the potential, with Allied Market Research predicting that asteroid mining will top \$3.8 billion by 2025⁷¹ and Morgan Stanley estimating the global space economy to be worth \$350 billion today.⁷²

Given the enormity of the resource-space market and the associated wealth, it is not surprising to see this translate into a race of nations, corporations and individuals *to get there first* in order to bag the associated prizes. And in this regard, it is equally not unforeseen to see a lack of respect for the philosophy of sharing riches in the spirit of cooperation and for the benefit of mankind. To a degree, it depends upon the moral compass of nations and even the international bodies of the UN. Whilst achieving sustainable development is a central goal of the UN where the foundation of ‘Our Common Future’ built upon the principles enshrined in The Universal Declaration of Human Right, the attainment of the goals will be brought no doubt into question and conflict.

The 17 goals, adopted in September 2015, aim, amongst other things, to end poverty, protect the planet, and ensure prosperity for all – this in itself arguably clashes with the current drive for space mining, not least the competitive nature which fails to accord the concept of sharing wealth on earth. Whilst our planet may benefit from the development and concentration of mining outside of it – i.e. in space, there are no doubt consequences or potential consequences linked to this. It really depends upon the thinking applied to the SDG’s as part of a greater perspective – which, according to Johnston et al (2007), there were at the time of writing, some 300 interpretations on. Regardless, both resource pessimists and resource optimists acknowledge that mineral resources (in many instances⁷³) on Earth are becoming depleted. A situation magnified with the ever-increasing population, whereby, according to Malthus’s (1798) predictions, this would lead to wars occurring over resource shortages. Whether the same holds true of mining in space has yet to be determined.

An article entitled ‘Mineral supply for sustainable development requires resource governance’ (Ali et al, 2017) pointed out the need for a framework and policing system. Recommendations made related to the adoption of various policies and international targets alongside common standards and the harmonization of best practice.

Taking Mancini and Sala (2018) earlier point (as within the introduction of this paper) - that the United Nations Sustainable Development Goals (UN-SDG’s) are unlikely to be attainable without the contribution of minerals and metals - it may be that internationally there is concerted drive to turn to space for assistance. This said, careful consideration should now be

⁷⁰ As said in, <https://oilprice.com/Energy/Energy-General/The-Golden-Asteroid-Worth-700-Quintillion.html> [Accessed 19 August, 2019].

⁷¹ Asteroid Mining Market to Reach \$3,868.9 Mn by 2025: New Study by Allied Market Research As reported 17 June, 2019.

<https://www.globenewswire.com/news-release/2019/06/17/1869592/0/en/Asteroid-Mining-Market-to-Reach-3-868-9-Mn-by-2025-New-Study-by-Allied-Market-Research.html> [Accessed 20 August, 2019]

⁷² By 2040, it is estimated to worth a \$2.7 trillion – source: , <https://oilprice.com/Energy/Energy-General/The-Golden-Asteroid-Worth-700-Quintillion.html> [Accessed 19 August, 2019].

⁷³ See Henckens, M.L.C.M., Driessen, P.P.J., Ryngaert, C & Worrell, E 2019. Resources Policy 92-101.

given to the governance mechanism for doing so – not least ensuring that equity and fairness prevails over greed and national dominance, so as to ensure peace. In many ways, it could also therefore be argued that the SDG's themselves need to extend beyond Earth.

Contrary to some reports – *identifying the first line of this paper* – asteroid mining is far from dead, the bubble has yet to burst. However, asteroid mining has yet to get off the ground with recent predictions estimating that it is unlikely to be achieved within the 2020's, as initially envisaged, but is more likely some 20-50 years off being realized.⁷⁴

5.3. Eyeing up other territory on earth as a solution to resource shortages: a USA perspective!

The USA expressed concerns as to the availability of resources at the end of the 19th century (Tilton, 2001& 2003), so it is not surprising that, as a nation, there has been reluctance and reticence to sign international agreements which would limit a national approach and the nations access to minerals and other resources – regardless of where they are.

So, what of the reports alleging that President Trump is interested in buying the independent Danish territory – Greenland?⁷⁵ Is it as absurd as it sounds?

The land is thought to be rich in resources – identified has been gold, diamonds, rubies, olivine, marble, copper, zinc, coal and oil.⁷⁶ With the ice melting, previously unreachable commodities are now becoming more easier accessible. And Trump is not the only one to have shown interest in the island. As far back as 1867 a report by the US State Department identified that William H Seward (Secretary of State) showed an interest both with regard to Greenland's strategic position and its abundance of resources.⁷⁷ Then, in 1946, Harry Truman offered to buy the island for \$100m; and, interest has also been allegedly more recently shown by China.⁷⁸

In Greenland the Premier Kim Kielsen has continued to reinforce the fact that the island is not for sale – stating that Greenland is “open for trade and cooperation with other countries, including the USA.”⁷⁹ While in the USA the Republican Representative, Mike Gallagher described the enquiry by Trump as a “smart geopolitical move.”⁸⁰

6. Conclusion

⁷⁴ Professor John Zarnecki, president of the Royal Astronomical Society, estimates that it would take around 25 years to get ‘proof of concept,’ and 50 years to start commercial production. <https://www.outerplaces.com/science/item/17778-700-quintillion-dollar-asteroid-space-mining-gold-rush-mars-jupiter> [Accessed 18 August, 2019]

⁷⁵ After Australia – Greenland is the largest island in the world.

⁷⁶ Sky News report Why does Donald Trump want to buy Greenland? Monday 19 August 2019 [Accessed 19 August, 2019] <https://news.sky.com/story/why-does-donald-trump-want-to-buy-greenland-11788910> And BBC News. Greenland: Trump warned that island cannot be bought from Greenland. <https://www.bbc.com/news/world-us-canada-49367792> [Accessed on 16 August 2019]

⁷⁷ Dyer, B., 1940. Robert J. Walker on Acquiring Greenland and Iceland *Journal of American History*, Volume 27, Issue 2, September 1940, Pages 263–266, <https://doi.org/10.2307/1896815>

⁷⁸ Ibid – Sky News.

⁷⁹ BBC News. Greenland: Trump warned that island cannot be bought from Greenland. <https://www.bbc.com/news/world-us-canada-49367792> [Accessed on 16 August 2019]

⁸⁰ Ibid.

The geological scarcity of mineral resources remains a concern to Earth. However, the reality is that much of this remains unknown which in itself creates uncertainty and fear.

There is no doubt that the increasing population of the world continues to put a strain on some resources including the cost of obtaining and mining these. Whilst, a 2006 study by the World Wildlife Fund (WWF⁸¹) warned that the human race is using the planet's resources at a pace that outstrips its capacity to support life. The report was particularly damning of the USA, identifying that the average USA resident consumes almost double the resources as that of a UK citizen. The USA was also accused of blocking many of the key initiatives on energy use, biodiversity and corporate responsibility. This allegation has similarities with the fact that the USA is reluctant to engage in international cooperation and strategies to mitigate some of these issues, no doubt linked to concerns that this could lead potentially to limiting its access to resources (including in the sea and in space).

In 2019, this message was repeated in terms of both confirming the ideology that humans are consuming too much of Earth's resources and of warning that the USA is using four times its share of sustainable global resources.⁸²

This said, in 1972 the international best-selling book *Limits to Growth* forecast that the human species would run out of aluminium by 2027, copper by 2020, gold by 2001, lead by 2036, mercury by 2013, silver by 2014, and zinc by 2022. But today, none of these metals are recognized to be in short supply. However, this said, according to other estimates, it is possible that our planet will run out of key elements that are needed for modern industry and food production within the next 50 to 60 years.⁸³

Given these concerns it would seem necessary to consider tapping into what has been identified as the virtually inexhaustible supply of resources located outside earth – namely in outer space. However, it has been shown that an appropriate governance mechanism is not in place and that UN systems, and international law, fails to accord adequate protection or ensure equity for humanity. Invariably, history stands to be repeated in terms of ownership and property claims, in space, which run the risk of destabilizing earth – politically and also through the potential for wars.

In the past, nations acquired territory on Earth predominately through military conquests and on occasions through financial deals. As late as 1867 the USA agreed to buy from Russia Alaska for \$7.2 million and in 1917 they purchased the Danish West Indies which they later renamed the US Virgin Islands.⁸⁴

However, as Professor Joseph Blocher identified the practice of buying territory from another nation has virtually ceased. As he recognizes, this is due to the fact that nations do not need to expand their sovereign territory as there is the means to get what they want through other

⁸¹ WWF's Living Planet Report 2006. <https://www.worldwildlife.org/press-releases/new-wwf-report-details-global-impact-on-natural-resources>

⁸² Why Resources Aren't 'Natural' and Will Never Run Out. 15 May, 2019. <https://wattsupwiththat.com/2019/05/15/why-resources-arent-natural-and-will-never-run-out/> [Accessed 20 August, 2019].

⁸³ Asteroid Mining: What Will It Involve and Is This the Future of Wealth? 1 August 2019. <https://interestingengineering.com/asteroid-mining-what-will-it-involve-and-is-this-the-future-of-wealth> [Accessed 19 August 2019]

⁸⁴ Purchase of the United States Virgin Islands, 1917 <https://2001-2009.state.gov/r/pa/ho/time/wwi/107293.htm> [Accessed 18 August 2019]

means.⁸⁵ Based on this rationale while Trump has raised the possibility of buying Greenland there is also potential for the USA to claim ownership of resources through claiming mankind's heritage (either at sea – i.e. on the sea bed) and/or applying the Space Resource Exploration and Utilization Act of 2015 (not least on the moon). And it could yet be that the USA revisits the actions of placing their 'Stars and Stripes banner' on the moon, and claims it and all the wealth that lies within. *The pursuit of resources that drove the discovery of America* could no doubt transpire to be.. [t]he same drivers ... for opening the space frontier” with the flag on the moon being one giant leap for the USA.

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