

**NEAR EAST UNIVERSITY  
GRADUATE SCHOOL OF SOCIAL SCIENCES  
MASTER OF LAWS IN INTERNATIONAL LAW PROGRAMME (LL.M)**

**MASTER'S THESIS**

**SPACE MINING LAW**

**ARDA ALP GÜREL**

**NICOSIA  
2016**

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## **ABSTRACT**

### **SPACE MINING LAW**

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LL.M, International Law Programme

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Space mining is one of those fictional ideas that science and space exploration technology have caught up with in recent years. A handful of private enterprises have triggered their Governments and the public to consider the possibility and utility in extracting minerals from celestial bodies. Consequently, the legal issues surrounding mining in outer space have been a topical subject of discussion in the international legal community.

The nature of activities in outer space have largely transformed from those of the Cold-war era. Presently, there are many private economic activities that are based on or derived from the use of outer space; All such activities adhere to well-defined laws and principles under International Space Law, that have so far been accommodative of these activities. However, that is not the case with space mining. Although, the economic and technical feasibility of space mining is debatable, it is the uncertainty and inadequacies in laws that act as first impediments to interested parties.

Keywords: Space Law, Space Mining, International Law

## ÖZ

Uzay Madenciliđi son yıllarda uzayın keşfi ve bilimsel teknolojinin imgesel fikirlerinden biri olmuştur. Hükümetlerin tetiklediđi özel girişimciler gök cisimlerinden maden çıkarmanın olasılıkları ve faydası üzerine düşünmeye başlamışlardır.

Bu tez, uzay madenciliđini saran hukuki meseleler çerçevesinde uluslararası toplumda yaşanan tartışmaları ele almaktadır. Uzat faaliyetleri doğası geređi Soğuk Savaş dönemi gelişmelerinden oldukça etkilenmiştir. Günümüzde ise uzay faaliyetleri de artık özel bir ekonomik faaliyet alanına dahil olmuştur.

Her ne kadar uzay madenciliđinin ekonomik ve teknik sürdürülebilirliđi tartışmalı olsa da uluslararası uzay hukuku açısından hukuki mülahazalar oldukça önem teşkil etmektedir.

Anahtar Kelimeler: Uzay Hukuku, Uzay Madenciliđi, Uluslararası Hukuk

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## **INTRODUCTION**

Space mining is one of those fictional ideas that science and space exploration technology have caught up with in recent years. A handful of private enterprises have triggered their Governments and the public to consider the possibility and utility in extracting minerals from celestial bodies. Consequently, the legal issues surrounding mining in outer space have been a topical subject of discussion in the international legal community.

The nature of activities in outer space have largely transformed from those of the Cold-war era. Presently, there are many private economic activities that are based on or derived from the use of outer space; All such activities adhere to well-defined laws and principles under International Space Law, that have so far been accommodative of these activities. However, that is not the case with space mining. Although, the economic and technical feasibility of space mining is debatable, it is the uncertainty and inadequacies in laws that act as first impediments to interested parties.

Space mining, influenced by several economic, political, and scientific factors, is inevitable in future. Recent events, such as the development of pilot missions to NEOs and the adoption of a bill on space mining in the U.S., warrant the consideration of space law and policy makers in arriving at a solution to the uncertainties presented by existing laws. A legal and regulatory framework that adequately governs the exploitation of mineral resources in space is thus, a need of the hour.



## METHODOLOGY

In developing the hypothesis, that *there is need for a new legal and regulatory framework to govern space mining*, the study begins with the evaluation of existing laws to recognize uncertainties and inadequacies therein, followed by a critical analysis of comparable regulations to identify elements that can be used for developing a new legal framework. Based on the resultant conclusions, suggestions for a new legal and regulatory framework will be derived. Towards this end, the study- adopting the prescription of international law sources<sup>1</sup>- will utilize primary sources such as laws, rules and regulations, and general principles of law; Also, extensive support will be drawn from academic writings and commentaries. The thesis will be structured to contain the following;

*Chapter 1* will be an introduction to the concept of space mining. It will discuss its economic and technical feasibility and identify legal questions that need to be addressed.

*Chapter 2* will analyze the existing legal framework under International Space Law, for the commercial exploitation of mineral resources in space. Firstly, the legal status of celestial bodies and their natural resources will be examined. Secondly, the possibility of classifying celestial bodies in order to define space resources that can and cannot be commercially exploited will be explored. Thirdly, principles and provisions of the Outer Space Treaty and provisions of the Moon Agreement relevant to space mining will be examined to determine the uncertainties in existing law and recognize the need for a new legal framework. Finally, the proposed national legislation on commercial space mining in the U.S will be reviewed.

*Chapter 3* will be an overview of existing legal and regulatory frameworks in the commercial exploitation of resources as under the regimes established for the deep seabed, Antarctic and GSO regions. Further, in this chapter, an attempt will be made to evaluate their application to the commercial exploitation of mineral resources in outer space.

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<sup>1</sup> Article 38(1) of the Statute of the ICJ.

*Chapter 4* deals with the way forward in the establishment of a new legal and regulatory framework, which will resolve existing conflicts by keeping in consideration the lessons learnt from the implementation of laws that govern the exploitation of global commons. In making recommendations, the focus will be on the legal nature of the new regime, the pivotal principles based on which the regime shall be built, and the manner of adoption of the new regime, before concluding the thesis.

## CHAPTER 1

### THE FUTURE: EXTRA TERRESTRIAL MINING

#### 1.1 What is space mining? Why mine in space?

Space mining is the commercial exploitation of natural resources in outer space, particularly from celestial bodies. Earth's mineral resources have contributed to the development of human civilization from time immemorial. For years now man has explored the possibilities of making use of all that the Earth offers from precious metals to gases. One indisputable fact is that humanity now consumes more natural resources than the planet can replenish. The current rate of consumption is a threat to the future prosperity of humankind. In the last 45 years, the demand for earth's natural resources has doubled, due to rising living standards in rich and emerging countries and increasing world population.<sup>2</sup>

The exhaustion of mineral reserves has created a situation of scarcity that have in turn triggered rising costs. Such conditions, coupled with advancements in technology and science, have pushed organizations to explore the possibilities of mining for resources in the hitherto untapped Polar Regions and the deep seabed. Natural progression has led man's search even to outer space.

The celestial bodies in outer space are said to contain abundant and high value mineral reserves.<sup>3</sup> Nearly all the gold, cobalt, iron, manganese, molybdenum, nickel, osmium, palladium, platinum, rhenium, rhodium, ruthenium and tungsten mined from Earth's crust, and that are essential for economic and technological progress, came originally from outer space.<sup>4</sup> Water and Helium are highly valuable resources in space. Unlike Earth, which is protected by its magnetic field, the Moon has been bombarded with large quantities of Helium-3 by the solar wind. It is thought that this isotope could provide safer nuclear energy in a fusion reactor, since

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<sup>2</sup>Cai do Céu, mas pode faltar, at <http://veja.abril.com.br/acervodigital>

<sup>3</sup><http://www.planetaryresources.com/asteroids/#market-for-metals>

<sup>4</sup>Matthias Willbold,; Tim Elliott,; Stephen Moorbath, *Geologists Point To Outer Space As Source Of The Earth's Mineral Riches*, University of Toronto, ScienceDaily, 2009,; The tungsten isotopic composition of the Earth's mantle before the terminal bombardment, *Nature* J 477, 2011, pp. 195-198.

it is not radioactive and would not produce dangerous waste products.<sup>5</sup> It has been estimated that the mineral wealth resident in the belt of asteroids between the orbits of Mars and Jupiter would be equivalent to about 100 billion dollars for every person on Earth today. Whereas asteroids are rich in the mineral raw materials required to build structures in space, the comets are rich resources for the water and carbon-based molecules necessary to sustain life. In addition, an abundant supply of cometary water ice could provide copious quantities of liquid hydrogen and oxygen, the two primary ingredients in rocket fuel.<sup>6</sup> Water can also be used as valuable life support material for astronauts. There are numerous uses for the extracted minerals. They can be put to use in space for in-situ utilization, brought back to earth, used as fuel and supply, enable future deep space missions etc. Whether such extraction will benefit earth-based industry or space-based industry, the outer space will be a distinct economic zone in future.

## 1.2 Feasibility of Mining in Space

Space mining is an economic and technical possibility, though not necessarily a reality.<sup>7</sup> It progresses through several tiers; 'Firstly, there should be ample spectral data indicating the presence of valuable minerals; Secondly, feasible technology for mining, processing, storage, retrieval, and transportation must exist; Thirdly, accessibility must be enabled by favourable orbital parameters;<sup>8</sup> Fourthly, there must exist a economic plan, that details available fiscal resources, a market for the extracted materials, industrial sustainability etc.,. Additionally, collective operation of these tiers entails a conducive legal framework.

For now, space entrepreneurs are targeting Near-Earth Asteroids,<sup>9</sup> as they satisfy most of the prerequisites for commercial space mining. Asteroids, are compared to other celestial bodies, easy to reach and are said to contain a vast amount of minerals. The claim that an asteroid's orbital mechanics are well

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<sup>5</sup>[http://www.esa.int/Our\\_Activities/Preparing\\_for\\_the\\_Future/Space\\_for\\_Earth/Energy/Helium-3\\_mining\\_on\\_the\\_lunar\\_surface](http://www.esa.int/Our_Activities/Preparing_for_the_Future/Space_for_Earth/Energy/Helium-3_mining_on_the_lunar_surface)

John S. Lewis, *Mining the Sky: Untold Riches from the Asteroid, Comets, and Planets*, Addison-Wesley, 1996.

<sup>7</sup> Ricky Lee, *Law and Regulation of Commercial Mining of Minerals in Outer Space*, (Vol. 7). New York Springer, 2012 at 16.

<sup>8</sup> Mark J Sonter, *The Technical And Economic Feasibility Of Mining Near Earth Asteroids*, Dept of Physics, UoW, 1996.

<sup>9</sup>As of June 2015, 12,745 near-Earth asteroids ranging in size from 1 meter up to ~32 kilometers have been identified, NASA NEO Discovery statistics at <http://neo.jpl.nasa.gov/stats>

understood, making asteroid trajectory calculations simple,<sup>10</sup> will be tested only when an actual mission to mine is undertaken. Scientists believe that such calculations are prone to deviations<sup>11</sup> and dependability on fixed plans may prove to be costly for space entrepreneurs. The quality of the ores and the consequent cost and mass of equipment required to extract it are undetermined for now and can only be speculated; the spectrum of available resources in space is yet to be fully analysed because of scientific and technical limitations. Planetary Resources<sup>12</sup> claims that platinum from a 30-meter long asteroid is worth 25-50 billion USD, however, an economist remarked that any outside source of precious metals could lower prices sufficiently to possibly doom the venture by rapidly increasing the available supply of such metals.<sup>13</sup> Some economic analyses indicate that the cost of returning asteroidal materials to Earth, far outweighs their market value, and that asteroid mining will not attract private investment at current commodity prices and space transportation costs.<sup>14</sup> Besides, much to the chagrin of space entrepreneurs, a report<sup>15</sup> was published in 2014 on ‘asteroids that could be mined’. It identified that only 10 asteroids, identified as yet, were bearing platinum ores. ‘Finding and characterizing near-Earth asteroids at a greatly enhanced rate is essential to identify potentially profitable candidates’.<sup>16</sup>

Moreover, the technology for space mining is rapidly and constantly evolving. Traditional mining technology meets space technology in the efforts to tap mineral resources in space. Extensive research is being conducted by NASA and American companies such as Planetary Resources, Deep Space Industries and Kepler Energy and Space Engineering to identify best propulsion systems, mineral determination components, attitude control systems, avionics etc.,. Similar to other space activities, space mining is also high-risk, time consuming and capital heavy, if

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<sup>10</sup> Timothy Spar, *Who Owns Asteroids Or The Moon?*, The New Scientist, Issue 2867, 2 June 2012.

<sup>11</sup> <https://www.strath.ac.uk/ascl/research/missionsystems/asteroiddeflectionontechologies/>

<sup>12</sup> Planetary Resources, Inc, is an American company that was formed in November 2010, whose primary goal is to expand Earth's natural resource base by developing and deploying the technologies for asteroid mining.

<sup>13</sup> Lawrence H. White, Professor of Economics at George Mason University at <http://www.redorbit.com/news/space/1112523850/asteroid-mining-venture-could-change-supplydemand-ratio-on-earth/#1w4QspKazuxsB2hZ.99>

<sup>14</sup> R. Gertsch and L. Gertsch, *Economic Analysis Tools For Mineral Projects In Space*, Space Resources Roundtable, 1997.

<sup>15</sup> Martin Elvis, *How many Ore-bearing Asteroids*, *Planetary and Space Science*, Vol.91, Feb 2014, at 20-26.

<sup>16</sup> Id.

not more. The payback period and the high risk involved make space mining a less competitive venture compared to terrestrial projects. Launching costs may be the most significant, which can only lower over time through increased competition and technological innovation. Asteroid mining will become more viable when fixed costs lower due to development in infrastructure.<sup>17</sup> Robust methods for comparison of different asteroid mining concepts, and for choosing between various trajectory, mission, and engineering alternatives, are needed so as to maximize project economic feasibility. As the cost of extracting mineral resources, especially platinum group metals, on Earth rises, the cost of extracting the same resources from celestial bodies declines due to technological innovations around space exploration.<sup>18</sup>

At present, commercial space mining is not a definitive alternate to terrestrial mining. Although existing mineral reserves are depleting, new discoveries are made each year. Several geographical reserves are unmapped for exploitation. The use of non-traditional mining techniques such as biomining, carbon-harvesting etc., are revolutionizing the terrestrial mining industry. Today, prospects of commercial space mining are a subject of human and technological marvel. Sooner or later, continued development in space mining techniques and technology, will lead to a disruption in traditional mining, similar to the one caused by the tapping of copper reserves and off-shore oil and natural gas in the last centuries.

### **1.3 Legal Issues**

In jurisprudence, natural law theory refers generally to the view that links law to morality and proposes that ‘just laws are immanent in nature and independent of the lawgiver, waiting to be discovered or found (as opposed to created by humans), usually by means of reason alone’.<sup>19</sup>

Commercial space mining is indeed a challenge to existing international space law. However, it is not a completely novel concept. The physical nature of the outer space, limited knowledge, and the effect of human endeavours in such a unique environment are the factors that require careful deliberation of the issue at hand, in order to understand its compatibility with existing principles and rules. The common

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<sup>17</sup> Rupert W Anderson, *The Cosmic Compendium: Space Law*, Lulu, 2014, at 105.

<sup>18</sup> *Supra*, note 7.

<sup>19</sup> G.S. Robinson, *Ecological Foundations Of Haley's Metalaw*, *Journal of the British Interplanetary Society* 22 (1969) 266-274.

perception is that existing international space law does not accommodate commercial space exploitation. This is however debatable. The aspiration to mine in space has thrown open a Pandora's Box, probing legal uncertainties, and questioning their present legal value. It has given rise to conflicting views and a call for revisiting the current space regime to establish a legal and regulatory framework to govern commercial space mining.

The questions on legality originate from and have a bearing upon three parties, namely, the States, Space Entrepreneurs, and States as a collective representing the international community. As to space resources, there are four domains of interactions:<sup>20</sup>

- Social - Customary perception of natural resources and how they are valued driven by an understanding of generational shifts;
- Policy - Political and Legislative context of resources, guided by varied ideologies with the objective to seek access, power, control etc,;
- Market - Economic flow of materials based on a determined structure;
- Biophysical -Physical flow of materials based on technological shifts, infrastructure, existence of resources and the laws of science.

Law is the solution derived from a collation many factors. Ideally, to regulate commercial space mining, the law must tackle existing uncertainties and gaps by arriving at a solution, drawn from the balancing of the above mentioned domains. All legal issues are not distinguishable between the three parties and the domains of interaction; they tend to overlap in some cases. Therefore, the legal issues at hand are listed below in no particular order:

- Is commercial space mining compatible with existing space law? To what extent?
- What regions or components of the outer space can be commercially exploited?

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<sup>20</sup> Resource Scarcity The Future Availability Of Natural Resources A New Paradigm For Global Resource Availability, World Economic Forum, November 2014, at [http://www3.weforum.org/docs/WEF\\_FutureAvailabilityNaturalResources\\_Report\\_2014.pdf](http://www3.weforum.org/docs/WEF_FutureAvailabilityNaturalResources_Report_2014.pdf)

- Is there a classification of the resources?
- What is the legal status of resources extracted in outer space?
- What rights are attached to the extracted resources?
- Who would license and regulate mining operations in outer space?
- Should commercial entities claim ownership rights through their State? To what extent?
- Will the law accommodate the economic interests of the commercial entities?
- To what extent should they be held responsible and liable for their activities?
- Should the principle of ‘non-appropriation’ in outer space be diluted? Would the outer space still be considered to belong to the international community as a whole?
- Can the commercial entities use their technology exclusively?
- Who should benefit from commercial space mining?
- Should there be an equitable distribution of the resources extracted or profits derived there from?
- Who has the authority to prescribe a legal and regulatory framework?
- How will the new regime be negotiated, implemented, and enforced?
- What is the role of non-space faring nations in law making? Should they be excluded until space capabilities are developed?

Although this is not an exhaustive list, it contains some of the most critical issues.



## CHAPTER 2

### SPACE MINING: IS IT LEGAL?

#### 2.1 Introduction

Commercial space mining falls in a grey area. The legal lethargy can be attributed to the fact that the scientific, financial, and technological capability to mine in space was largely hypothetical. However, as the space industry moves towards attaining this capability, it becomes necessary to ascertain the legality of space mining. In order to understand how mining in space fits within the scope of international space law, it is necessary to identify the subject-matter viz., natural resources in space, what law and provisions therein, govern these resources, and how their exploitation is regulated, if permitted.

#### 2.2 Space Law Premise

The extent of application of space law and the definition of the terms therein, play a crucial role in determining the legality of space mining. A historic study of the evolution of space law would clearly reveal that space mining was not a priority on the agenda of the drafters. Space law legislation was a defensive move to preserve and protect the realm of outer space from conflicts. Consequently, the Outer Space Treaty contains principles that are permissive, subject to certain elements of control and restraint. Space mining is also subject to such controls and restraints, as will be detailed in the sub-chapters. In spite of this, space mining, as envisaged by space entrepreneurs, is not yet compatible with the existing legal regime. The incompatibility begins with the jurisdiction of space law and classification of natural resources in space, particularly celestial bodies.

##### 2.2.1 Scope of Space Law

Space is a lesser known environment, which is both hostile and indefinitely rich.<sup>21</sup> It would be a mistake to state that ‘space is ... a precious natural resource’.<sup>22</sup> It

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<sup>21</sup> Bryan S. Turner, *The Routledge International Handbook of Globalization Studies*, 2009, at 544.

<sup>22</sup> Otto Koudelka, *Space-A Natural Resource, in Outer Space in Society, Politics and Law*, Eds

is impossible to presume that space is a singularity whereas the reality is that it comprises of various physical phenomena, of which we have only a limited knowledge. Within the confines of this limited knowledge, scientific and technological advancements have identified several natural resources in space that may be potentially exploited in future.

International Space Treaties do not precisely mention the scope of space law. The Title and the Preamble of the Outer Space Treaty,<sup>23</sup> make use of the terms ‘activities of States’ ‘outer space’ and ‘celestial bodies’, from which usage, the context of legal application is derived. However, ‘any man-made normative regulation of space activities cannot be applicable to the entire universe’.<sup>24</sup> It is well to keep in mind at all times, that as lawyers, we speak here not of ‘space law’ but of national and international law concerning activities in outer space.<sup>25</sup> While ‘... the international community has not yet been able to agree on a binding document to create legal certainty about the scope of space law’,<sup>26</sup> Article 1 of the Moon Agreement,<sup>27</sup> reflects the intent to limit the scope of space law to ‘celestial bodies within the solar system’; it should be noted that as lawyers and as a community we should limit ourselves to developing and interpreting laws only to the extent of our current and immediate future capabilities viz., space mining.

## **2.2.2 Definition of Outer Space and Celestial Bodies**

The issue of the delimitation and definition of outer space has for long been featured on the agenda of the Legal Subcommittee of UNCOPUOS. Acting upon a proposal by France, ‘Questions relative to (a) the definition of outer space and (b) the utilization of outer space and celestial bodies ...’, were included in the agenda of the UNCOPUOS in 1966<sup>28</sup>, and were considered for the first time at its sixth

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Christan Brunner, Alexander Soucek, SpringerWein NewYork 2011 at 92.

<sup>23</sup>1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, entered into force 10 October 1967, 610 UNTS 205, hereinafter the OST

<sup>24</sup> Commentary on *Article I* of the Outer Space Treaty, Stephan Hobe, COCOSL VOL 1 (2009) at 25-43.

<sup>25</sup>S.Houston Lay and Howard J.Taubenfeld, *The Law relating to Activities of Man in Space*, University of Chicago Press, 1970.

<sup>26</sup>Supra, note 22, Thomas Neger and Edith Walter, *Space Law-An Independent Branch Of The Legal System*, at 234-245.

<sup>27</sup> Agreement concerning Activities of States on the Moon and other Celestial Bodies, 1023 UNTS 21, hereinafter the Moon Agreement.

<sup>28</sup> Official Records of the General Assembly, Twenty-first Session, Summary Records of Meetings,

session, in 1967.<sup>29</sup> Although, the Legal Subcommittee has heard diverse views on the issue and considered and addressed numerous proposals receive,<sup>30</sup> no consensus, other than one that refers the issue to the Scientific and Technical Subcommittee for consideration has been reached.

While so, guidance may be sought from general meanings. Outer space is commonly defined as 'the physical universe beyond the earth's atmosphere'.<sup>31</sup> It 'encompasses the terrestrial and the interplanetary space of the universe, whereby the delimitation of the Earth space around the earth to outer space starts at least 110 km above sea level'.<sup>32</sup> Physically distinguishable entities, called celestial bodies form an integral part of the outer space.

The term 'celestial bodies' is an umbrella term used for various natural physical phenomena in space, that include but are not limited to planets, their satellites, asteroids, comets, meteors, etc.. This term, while not defined, is employed throughout the Outer Space Treaty and appears to mean all heavenly bodies.<sup>33</sup> A definition states that 'celestial bodies are all material objects that can be transported in toto through outer space'.<sup>34</sup> This was used as a basis by the Working Group III of the International Institute of Space Law which defined these bodies as 'all natural objects in outer space, including their eventual gaseous corona, which cannot be artificially moved from their natural orbits'.<sup>35</sup> However, with technological advancements, these definitions may not hold ground. Already, methods and devices to move asteroids and someday even the Earth are emerging. If such technologies materialize, the devices would be exercising control over the asteroid, in turn raising 'the possibility that by altering the asteroid's orbit the intercepting nations change[d] its legal status from that of a 'celestial body' for which no one was responsible to that

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First Committee, 1492nd meeting, para. 21 (A/C.1/SR.1492); Verbatim Records of Meetings, Plenary, 1499th meeting, paras. 148-150 (A/PV.1499); and General Assembly resolution 2222 (XXI), para. 4 (b)

<sup>29</sup> Historical summary on the consideration of the question on the definition and delimitation of outer space, A/AC.105/769, LSC UNCOPUOS, 41<sup>st</sup> Session, April 2002.

<sup>30</sup> Draft report of the Chair of the Working Group on the Definition and Delimitation of Outer Space, A/AC.105/C.2/2011/DEF/L.1, LSC UNCOPUOS, 50<sup>th</sup> Session, April 2011.

<sup>31</sup> Oxford Dictionary of English (3 ed.), Ed. Angus Stevenson, Oxford University Press, 2010.

<sup>32</sup> E. Vitt, 'Grundbegriffe und Grundprinzipien des Weltraumrechts', K-H Bockstiegel, Handbuch des Weltraumrechts, Carl Heymans, Cologne, 1991.

<sup>33</sup> Encyclopaedia Dictionary of International Law, Eds John P. Grant and J. Craig Barker, Third edition, Oxford University Press, Jan. 2009.

<sup>34</sup> E. FASAN, *Weltraumrecht*, Mainz, Krausskopf, 1965, 113

<sup>35</sup> Virgiliu Pop, *Who Owns the Moon?: Extraterrestrial Aspects of Land and Mineral Resources Ownership*, Springer Science & Business Media, Nov 16, 2008, at 54.

of a 'space object'.<sup>36</sup> Such an interpretation would attract State responsibility and liability for the course of the asteroid, as it would then be under the jurisdiction and control of the State that engages in the deflection maneuvers.

If one turns towards science for clarity, even there celestial nomenclature is a subject of controversy. Limited technical progress in the identification and classification of celestial bodies, uncertainties as to their characteristics, new discoveries etc., contribute to debates in the astronomy circles. Therefore, it is difficult to arrive at a conclusive definition. While so, there is also the question of whom or on what basis should the celestial bodies be defined. A strictly scientific approach may not suit for the application of law and a legal definition without a scientific basis may be unsound.

### **2.2.3 Classification of Celestial Bodies**

Space has abundant natural resources ranging from solar energy to mineral resources. 'Every material and immaterial object and phenomenon in outer space, including orbits, points, solar rays and radio frequencies'<sup>37</sup> are considered natural resources in space. Mining begins with the identification of an ore-body; in space that is restricted to the natural resources that can be found in physical entities viz., celestial bodies like the moon, planets, their satellites, asteroids and comets. In circumstances, as mentioned above, it is impossible to apply a sweeping definition or even laws to objects that are fundamentally different to each other. Any exercise to identify celestial bodies that can be mined and group them under one category will, therefore, be futile. Nevertheless, this has not stopped space lawyers and enthusiasts from suggesting various approaches<sup>38</sup> that can be adopted in classifying celestial bodies.

Firstly, it is the identification based on the extension of the territorial property notions of movables and immovables, which are governed by *lex domicilii* and *lex situs* respectively. Accordingly, if a celestial body is considered a movable property in space, then there is a possibility that it may become an object of private

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<sup>36</sup> Hannes Mayer, *IF AN ASTEROID HEADS FOR EARTH Taking the hit for World*, at <http://worldif.economist.com/article/12/what-if-an-asteroid-heads-for-earth-taking-the-hit>

<sup>37</sup> M. WILL, *Solar Power Satellites Und Völkerrecht*, Stuttgart, Boorberg, 2000, at 5960.

<sup>38</sup> Supra, note 35, consolidated and classified as such by Virgiliu Pop

property rights, as unlike the land or an immovable, it can be physically transferred and/or destroyed. This is also the basis for the control approach, which is derived from the canon-shot rule as was applicable to the delimitation of territorial sea from the high seas. An extension of application to the outer space means that celestial bodies are those that cannot be moved or controlled by humans. GÄL considers celestial bodies to be all astronomical objects that are sufficiently large to allow for manned and unmanned landing and which cannot be deviated from their orbit.<sup>39</sup> Current capabilities in moving asteroids are a challenge to such a classification. Taking cue from Hannes Mayer's point,<sup>40</sup> for example, the use of deflection technologies will lead to the consideration of an asteroid as a movable property; and being under the control of a State there is a possibility that the State can exercise private property rights on the asteroid. An assumption based on the extension of terrestrial property laws would thus work against popular notions in international space law.

Second comes the spatialist approach which 'would define celestial bodies as objects over a certain size',<sup>41</sup> while objects under that size would not be deemed as celestial bodies. Experts such as Dr. Ernst Fasan, J Sztucki, S M Williams, G Gal<sup>42</sup> etc., have debated over the size of asteroids, meteors, and meteorites to determine which of these are celestial bodies and how those that are not may be subject to appropriation.<sup>43</sup> G P Zukhov identifies only 'planets and their natural satellites, asteroids and large meteorites excluding comets, micro meteorites and smaller meteorites' as falling within the scope of the Outer Space Treaty.<sup>44</sup> Cocca goes one step further to state that 'celestial bodies should at least be amenable to occupation'.<sup>45</sup> However, such a classification has its limitations. Attaching a numeric value to the size of celestial bodies, for the purpose of classification, apart from being impracticable, will prove to be restrictive for future exploitation of resources. For example, comets comprise of rock, dust, water ice, and frozen gases such as

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<sup>39</sup> G. GÄL, *Space Law*, Leiden, Sijthoff, 1969, 186-187.

<sup>40</sup> *Supra*, note 36.

<sup>41</sup> Virgiliu Pop, *A Celestial Body is a Celestial Body is a Celestial Body...*, 52<sup>nd</sup> IAF Congress, Oct 2001.

<sup>42</sup> *Supra*, note 39.

<sup>43</sup> Viorel Badescu, *Asteroids: Prospective Energy and Material Resources*, Springer Science & Business Media, Jul 3, 2013.

<sup>44</sup> The Problem of Definition of Outer Space, 10 PCLOS 271, at 273

<sup>45</sup> A.A. COCCA, *Legal Status Of Celestial Bodies And Economic Status Of Celestial Products*, 5 IISL Proceedings 1962, 4.

carbon dioxide, carbon monoxide, methane, and ammonia, which may be tapped into by space mining enterprises. Similarly, smaller asteroids may be easier to capture and consume or technology may advance so rapidly that even bigger asteroids may be exploited.

Third comes the functionalist approach, which would take into account the actual use of a celestial body, e.g., building a base, exploitation of resources, or navigation.<sup>46</sup> This approach does not stress on a prior classification of celestial bodies based on their size or physical properties. Instead, it ‘allows for a more flexible regulation of human activities in space, in keeping with the characteristics of the specific spatial phenomenon with which it is concerned’.<sup>47</sup> Thereby, the provisions of the Outer Space Treaty are to be interpreted in such a way, that the purpose of the provision will identify the celestial bodies to which that particular provision will apply.

Fourthly, the space object approach; which has quite futuristic origins, as some scientists, including Fasan<sup>48</sup>, have a vision that someday carved-out asteroids would be used as space objects under the control and supervision of States, thereby requiring registration. This is a far-fetched idea that may remain on paper for a long time to come. However, the possibility of a celestial body being used as a space object is debatable considering that human intervention to change orbits or wield control over their course is possible. As stated earlier, the fact that a celestial body can be controlled could render it to be a space object.<sup>49</sup> Would an interpretation be arrived upon that the extension of human control makes a celestial body a space object? It remains to be seen.

Finally, natural resources such as icebergs and fish in the high seas have been used as an analogy to celestial bodies in space.<sup>50</sup> Although a cursory approach may lead us to believe that they are analogous situations, there are marked peculiarities to each of the situations. As stated earlier, the term 'celestial bodies' encompasses

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<sup>46</sup> Supra, note 41.

<sup>47</sup> Philip De Man, *The Exploitation Of Outer Space And Celestial Bodies - A Functional Solution To The Natural Resource Challenge*, 2010.

<sup>48</sup> Ernst Fasan, *Large Space Structures and Celestial Bodies*, 27 PCLOS 1984, at 243.

<sup>49</sup> Supra, note 36.

<sup>50</sup> Virgiliu Pop, *Who Owns the Moon?: Extraterrestrial Aspects of Land and Mineral Resources Ownership*, Springer Science & Business Media, Nov 16, 2008.

several physical entities in space. They are not infinite resources. Moreover, our limited understanding of the consequences of their exploitation attaches a certain risk to their use. While the regulation of high seas and its exploitation may be used as a guideline for the space mining activities, such law and regulation must reflect the unique characteristics of the space environment.

#### **2.2.4 A New Approach**

Natural resources are defined as ‘any material from nature having potential economic value’.<sup>51</sup> The factor that determines whether or not an object is a resource is its commercialization. Mining in space involves many preliminary activities that will eventually culminate in the extraction of mineral resources. A major portion of the activities will concentrate on the identification of the right celestial body to mine, by analyzing its composition, its commercial value, technical feasibility, the return on investment, and ideally the environmental impact. Thereafter, only those celestial bodies that are commercially and technically viable, i.e., that are of utility, will be mined. It is suggested that such ‘Utility’ should be the basis of classification of celestial bodies for the purpose of mining. In essence the various stages of mining can be split into two phases, namely, the exploration phase (traditionally mining claim) and exploitation phase (claim staking). Without doubt or contradictions, international space law has an established framework for exploration of outer space. It is the second stage that is still a matter of debate. While so, in the nascent years of commercial space mining, classification based on the ‘utility model’ will aid in limiting the scope of law governing commercial mining to identifying certain areas where ownership rights over resources and support rights and duties can be vested, as in terrestrial mining laws. Established principles in space law need not be disturbed or diluted entirely to accommodate mining. Instead application of laws specific to an activity can be introduced.

If asteroids are taken as an example, applying the above-mentioned process, not all asteroids have equal or equivalent commercial value; it depends on their composition. Moreover, extraction may not be technically feasible on some asteroids. The same may apply for comets or planets. Any one of the factors that determine the viability of mining may preclude a celestial body from being mined.

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<sup>51</sup> Black’s Law Dictionary, 9<sup>th</sup> Ed, 2009.

In such circumstances, classification based on the utility approach will help determine common rights, obligations and restrictions in relation to different types of celestial bodies and would thus facilitate in the application of existing or future space law. The focus will be limited to a certain number of celestial bodies. Consequently, licensing or authorization to mine, and regulation of the activities of commercial space entrepreneurs will also be simplified. This approach will demand interaction and co-operation of experts from the fields of science, commerce, and law. This collaboration will pave the way for the evolution of law to address the needs of a matured space mining industry and resultant advancements. Similar circumstances in land classification and applicability of laws, led to the evolution of mining laws in the U.S, which transitioned from the selfregulated Western Miner's codes, to the 1872 Mining Law and its subsequent amendments, wherein the government would open up lands that were in the public domain to private entities staking a claim to mine. The private entities would have ownership rights subject to the control of the State and it was limited to the resources so extracted. Duties for the preservation of land and protection of adjacent owners were clearly laid down. Further, certain areas were marked off as prohibited or restricted, over which private entities could not stake a claim. The evolution of mining laws the world over, have been subject to such transitions, owing to the technological advancements of that time. The same can be expected out of commercial space mining too.

As States are still divided over the need to address the issue of definition and delimitation of outer space,<sup>52</sup> space mining may thrive even without the definition of terms, determination of the scope of international space law or a classification of the celestial bodies. Then again, the incompatibility will not be solved fully. Mining in space is a big step; the lack of concrete solutions, would only invite more controversies and debates, which may eventually stall commercial exploitation. Clarity of law is a prerequisite and this should begin from the basics.

### **2.3 Existing Space Law Regime**

With the deployment of the 'Arkyd 3 Reflight'<sup>53</sup> from the International Space Station on July 16, 2015, a new era in space activities has begun. Although the probe

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<sup>52</sup> Draft report of the Chair of the Working Group on the Definition and Delimitation of Outer Space, A/AC.105/C.2/2015/DEF/L.1, LSC UNCOPUOS, 54<sup>th</sup> Session, April 2015.

<sup>53</sup> Test Probe of Planetary Resources.



will not be mining asteroids, it is the first stage in a series of test flights whose ultimate goal is the mining of asteroids. Even at this pre mature stage, for several months now, space mining has been the subject of debates. The most significant of all is the legal debate. Speculations and marvel-fueled discussions about the fast pace of advancing technologies often make one forget that it is not a ‘Wild West’ scenario in space. International Space Law has been organic law in accommodating the various activities that have advanced in space. This will persist for space mining too. Nonetheless, distinctiveness of this activity demands more from the existing regime in terms of precision and in certain cases, expansion or supplementation.

### **2.3.1 Outer Space Treaty**

The launch of Sputnik I in 1957, urged the international community to develop rules for the orderly and safe use of space. Towards this end, the UNCOPUOS and many legal scholars, using various key principles and notions, created the magna carta of space law viz., the Outer Space Treaty. The provisions of the Outer Space Treaty are a reflection of the sociopolitical situation existing at the time of its formulation. The Outer Space Treaty was a treaty of principles that sought to provide a basis for the future rather than solve and regulate at instance all aspects of space activities.<sup>54</sup> Therefore, the exploitation of space does not find specific reference, yet, the law is inclusive.

#### **2.3.1.1 The Province of Mankind**

Article I of the OST embodies the notion of the ‘province of mankind’. This notion brings the lead provision of the OST in line with the legal regulation of human activities on other common spaces, such as activities on the High Seas and the Deep Sea Bed.<sup>55</sup> The outer space is therefore not owned by a State or States. Even so, contrary to the view of some scholars<sup>56</sup>, it was not interpreted as *res nullis*,<sup>57</sup> as,

“ ... *in history any res which is not under authority can be brought under*

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<sup>54</sup> Fabio Tronchetti, *The Exploitation Of Natural Resources Of The Moon And Other Celestial Bodies: A Proposal For A Legal Regime*, Martinus Nijhoff, 2008, at 8.

<sup>55</sup> *Supra*, note 24.

<sup>56</sup> Bin Cheng, *The Extra-terrestrial Application of International Law, Current Legal Problems*, 1965, at 143.

<sup>57</sup> A thing without an owner, Roman Law Concept.

*authority... Therefore, the obvious conclusion is that individual nations can obtain sovereignty over such parts of celestial bodies upon which their power is properly vested”.*<sup>58</sup>

Over the years, the developing pattern of outer space activities recognized elements of both<sup>59</sup> *res omnium communis*<sup>60</sup> and *res extra commercium*<sup>61</sup>. These elements have a bearing on all space activities and rights embodied in the OST.

### **2.3.1.2 Rights and Limitations**

Article I of the OST fuses the rights and duties of States in one provision. On the one hand it sets out three rights namely, the right to free access, the right of free exploration and the right of free use, and on the other these rights are subjected to the controls of non-discrimination and are to be carried out for the benefit and in the interest of all mankind. Although there is no express mention of the right of free exploitation, the term ‘use’ may be construed to mean ‘exploitation’.<sup>62</sup> Further, ‘...the freedom of use contains the possibility of any entity to utilize outer space and its resources as well as the resources of the celestial bodies, be it for commercial or non-commercial ends’.<sup>63</sup> A reading of paragraphs 2 and 3 of Article I may also be construed to distinguish between the freedom of exploration and the freedom of scientific investigation. ‘Exploration is the general finding out of something yet to be explored, which may or may not include scientific activity. Use means non-economic and economic use of outer space. Thus, the use of outer space for economic needs can include exploitation of outerspace and/or the celestial bodies with the goal of making economic profit’.<sup>64</sup> While such an interpretation is conducive for space mining, it is contentious, as it will have corresponding ramifications on how outer space is used.

The use of the phrase ‘without any discrimination of any kind’ in the OST,

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<sup>58</sup> J Verplaetse, *Can Individual nations Obtain Sovereignty over Celestial Bodies?* Proceedings of the Third Colloquium on the Law of Outer Space 1961 at 311.

<sup>59</sup>Supra, note 25

<sup>60</sup> ‘...incapable of ownership and control and open for free exploration and use’, Malcolm N.Shaw, *International Law*, Cambridge, 2008 at 432-434.

<sup>61</sup> Thing outside commerce, Roman Law Concept.

<sup>62</sup> The term use is equivalent to the term exploitation, French Representative, UN Doc.A/AC.105/C.2/SR.64, at 4, October 1996.

<sup>63</sup> NM Matte, *Space Activities and Emerging International Law*, Sweet and Maxwell, London 1984, pp.249-274

<sup>64</sup>Supra, note 24.

emphasizes an approach of material equality.<sup>65</sup> Accordingly, the degree of economic development or space capabilities should not inhibit the rights of any State. Even if States are incapable of actually using or exploring outer space and its resources, they may be entitled to do so.<sup>66</sup>

This is coupled with the use of the phrase ‘for the benefit and in the interest of all mankind’. The obligatory nature of this limitation is not questionable as it forms an inseverable part of Article I. However, to what extent other countries should benefit or to what extent their interests should be considered is unclear. No State can claim as a matter of right, benefits from the efforts of another State, yet the common understanding is that eventually all States would reap the benefits of such efforts. The UNGA Declaration on Space Benefits,<sup>67</sup> made it clear that ‘no general obligation to co-operate and no general duty to grant benefits to non space-faring nations are incumbent upon the space-faring nations’.<sup>68</sup> This was reiterated by the International Law Association which stated that ‘... there is no stringent obligation on any State to share the benefits derived from ... use’,<sup>69</sup> giving States the discretion on benefit-sharing. This may seem to be a deviation from the spirit of the drafters; however, it is impractical to share the benefits between all States. This is truer when it concerns commercial activities, as they are ‘by definition, undertaken with a view to profit and as such profits are to be shared only by the members of the private concern or the relevant governmental agency’.<sup>70</sup> Until now, only a few countries are space-faring nations, out of which only a few countries have launching capabilities; Even so, the benefits of space activities are wide spreading and have percolated down to even States that are remote to space exploration and use. A strict application of this principle would not have led to any growth in space activities. This may set an example for space mining considering that very few countries, even amongst the space-faring nations have or are developing mining capacities.

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<sup>65</sup>Id..

<sup>66</sup>M Marcoff, *Telediffusion Par Satellite Et Droit International* in M Bodenschatz ed, Festschrift Alex Meyer, Carl Heymans, Cologne 1975.

<sup>67</sup> UNGA Res 51/122 (13 December 1996), ‘The Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the interest of all States, taking into particular account the needs of developing countries’, UN Doc A/Res/51/122

<sup>68</sup>Supra, note 24.

<sup>69</sup> Res 1/2002.

<sup>70</sup> Ricky J. Lee, *Creating a Practical Legal Framework for the Commercial Exploitation of Mineral Resources in Outer Space*, 2009 at 323.

### 2.3.1.3 Non-Appropriation

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,”

i.e., there can be no claims of ownership or establishment of titles in outer space. Further, it ‘makes clear that the customary procedures of international law allowing subjects to obtain sovereignty rights over un-owed lands, namely discovery, occupatio and effective possession, do not apply to outer space’.<sup>71</sup> Two oft argued issues as regards this provision are: firstly, its applicability to private entities or individuals and secondly, the appropriation of space resources.

Some private enterprises and individuals use the argument that Article II does not expressly prohibit them from making claims, exploiting or appropriating the celestial bodies for profit. Private entities are permitted to conduct space activities only in accordance with Article VI of the OST, which requires a State to authorize such activities. Obviously, ‘it follows that what is forbidden to a State is not permitted to a chartered company created by a State or to one of its nationals acting as a private adventurer’.<sup>72</sup> Therefore, there is no need for an explicit mention that this provision applies also to private entities.<sup>73</sup>

Nevertheless, it makes no mention about the appropriation of resources in space. Some authors<sup>74</sup> are of the view that this provision is applicable to the resources in space too. It may be said that the resources are a part of the whole and therefore any appropriation of the resources cannot be an independent act. Space entrepreneurs will obtain certain rights over the resources obtained from space and such rights originate from such ‘appropriation’. Some others<sup>75</sup> are of the opinion that

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<sup>71</sup> Fabio Tronchetti, *The Non-Appropriation Principle Under Attack: Using Article II Of The Outer Space Treaty In Its Defence*, 2007.

<sup>72</sup> Jenks, *Space Law*, London, Stevens and Sons, 1965, 201

<sup>73</sup> Sterns, Tennen, *Privateering And Profiteering On The Moon And Other Celestial Bodies: Debunking The Myth Of Property Rights In Space*, PROCEEDING OF THE FORTY-FIFTH COLLOQUIUM ON THE LAW OF OUTER SPACE, 56, (2002).

<sup>74</sup> S.Gorove, *Interpreting Article II of the Outer Space Treaty*, Proceedings of the Eleventh Colloquium on the Law of Outer Space 1968 at 40,

<sup>75</sup> Report of the 54<sup>th</sup> Conference of the International Law Association 1970 at 434; UN Doc

‘States are entitled to appropriate outer space natural resources so long as their activities do not involve any permanent claims to appropriation of, or exercise of authority over the areas in which the resources are appropriated and until such activities do not prevent other nations from doing the same’.<sup>76</sup> Such a view finds support from Carl Q. Christol, who states that:

*“The Principles Treaty makes no explicit reference to the exploration, use and exploitation of the resources of the environment. The agreement neither expressly authorizes nor prohibits the exclusive acquisition of the resources of the area. Nonetheless, the general availability of such resources for inclusive exploration, exploitation and use, by way of space-related activities, can be supported on several grounds”,<sup>77</sup> “...unless such activity is prohibited under other norms of international law. None appear to exist.”<sup>78</sup> Although, the view that the resources run along with the land or in our case, the celestial body, is plausible, Article II seems to refer to appropriation in a spatial concept. A combined reading of Articles I and II of the OST may support the above view by connoting that the freedom of ‘use’ is limited only by a prohibition to the establishment of titles of ownership and sovereignty in outer space. For example, the ‘geo-stationary orbit’, is a limited resource in space. No State may appropriate a position,<sup>78</sup> however, allocations are made by the International Telecommunication Union,<sup>79</sup> for use by those States, even for profit. Further, elements of sovereignty do find place in certain provisions of the OST<sup>80</sup>, such as in the international responsibility of States, registration of space objects, non-interference with space activities of other States etc.”<sup>81</sup>*

In the context of mining natural resources in space, appropriation will be the

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A/AC.10/C.2/L.71

<sup>76</sup> Supra, note 54, at 166.

<sup>77</sup> Carl Q. Christol, *Article II of the Outer Space Treaty Revisited*, 9 Annals of Air and Space Law 217, 1984.

<sup>78</sup> Declaration Of The First Meeting Of Equatorial Countries, Adopted on December 3, 1976, ITU Doc. WAERC-BS-81-E or the Bogota Declaration, is an unratified UN declaration containing claims of sovereignty over the geostationary orbit, rejected by several States, as against the general international law principle of nonappropriation in outer space.

<sup>79</sup> hereinafter, the ITU.

<sup>80</sup> Charles Lawson, *Regulating Genetic Resources Access and Benefit Sharing in International Law*, Intellectual Property and the Environment series, EE, 2012 at 82,83.

<sup>81</sup> Article VI, VII, and IX, respectively of the OST.

taking and/or consumption of these resources. Historically, there appears to have been no controversy over materials collected from space and returned to earth becoming the property of a person, company or the government,<sup>82</sup> then again, these were only samples. The question on the extent to which, natural resources may be collected or consumed, however, remains unresolved.<sup>83</sup>

#### **2.3.1.4 State Responsibility and Liability**

Articles VI and VII of the OST deal with a State's responsibility and liability respectively, for national activities in space, including that of private entities. Article VI lays an obligation on States to regulate the activities of private entities by authorizing their activities. It requires also continued supervision. Any private entity seeking to mine in space, would derive a right to do so only subject to such authorization by a State. The objective is to hold the States responsible for ensuring that their space activities are compliant with the OST. The consequence of a default is the liability imposed under Article VII. As the liability rests with the State even for private entities, States would be cautious in authorizing space mining activities. The growing need for concrete regulation of space activities in view of an increased participation of private actors has motivated States to adopt national legislation;<sup>84</sup> Pursuant to the duty imposed under Article VI of the OST, it becomes a necessity to ensure that private actors are bound by the legal principles and obligations of the OST, in order for the peaceful exploration and use of outer space. While so, a national legislation must incorporate the principles of the OST in its entirety. Any contradiction would also be deemed a clear violation and breach of customary international law.

Thus, a national legislation addressing commercial exploitation of space cannot be ultra vires the OST.<sup>85</sup>

#### **2.3.1.5 Principles governing the conduct of space activities**

Article IX of the OST prescribes the exercise of international cooperation

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<sup>82</sup> G.Gal, 'Acquisition of Property in the Legal Regimes of Celestial Bodies' [1996] Proceedings of the 39th Colloquium on the Law of Outer Space at 45.

<sup>83</sup> Henry R. Hertzfeld and Frans von der Dunk, *Bringing Space Law into the Commercial World: Property Rights without Sovereignty*, 2005, pp 84-86.

<sup>84</sup> Irmgard Marboe, *Culmination of efforts in the area of National Space Legislation in 2012*, Proceedings of the International Institute of Space Law, 2012, pp.516-527.

<sup>85</sup> See 2.4

and mutual assistance in the conduct of space activities with due regard to the corresponding interests of States. It further advocates against harmful contamination of and introduction of adverse changes to the space environment. The extent to which States abide by these principles is debatable. The concepts embodied herein may ‘provide an important starting point for the further elaboration of obligations and for a more developed control mechanism for space resource utilization’.<sup>86</sup> Space mining being the sum of several space-based activities, requires observance of these principles to satisfy the rules set out in Article I of the OST. The history of mining in each country will reveal that the activity has intense ramifications on the environment. Awareness has lead mining laws to incorporate elements for the preservation and protection of the environment such as impact assessment, planning, management and monitoring, and rehabilitation. Further, standards and certification procedures are also prescribed and adopted through the International Standards Organization (ISO) and other private international organizations. Considering that the outer space is a fragile environment, similar or even higher standards for environmental protection would need to be applied.

### **2.3.2 Moon Agreement<sup>87</sup>**

Following United States’ moon landing in 1969, there arose a need for a law to deal with man’s activities on the Moon and other celestial bodies. As a result, the 1979 Moon Agreement was born, amplifying the provisions of the OST and introducing new elements having practical purposes for future space missions, particularly concerning the exploitation of outer space. From the stage of negotiations, portions of this agreement have been the subject of many misunderstandings and controversies, a reflection of which can be found in the poor ratification by States.<sup>88</sup>

The Moon Agreement reiterates the principle of non-appropriation<sup>89</sup> as stated in Article II of the OST, and expands further stating that:

*“Neither the surface nor the subsurface of the Moon, nor any part*

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<sup>86</sup> Lotta Viikari, *From Manganese Nodules to Lunar Regolith: A Comparative Legal Study of the Utilization of Natural Resources in the Deep Seabed and Outer Space*, LUP, 2002 at 93.

<sup>87</sup> *Supra*, note 27.

<sup>88</sup> 16 States have ratified this Agreement as of July, 2015. There are 4 States that are signatories but have not yet ratified the agreement.

<sup>89</sup> Article 11(2)

*thereof or natural resources in place, shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person”.*<sup>90</sup>

However, it is permitted for scientific investigation<sup>91</sup>, the collection and removal of samples of minerals and other substances,<sup>92</sup> in appropriate quantities for the support of their missions. Article 4 of this agreement is a reflection of the principles laid down in Articles I and IX of the OST viz., ‘for the benefit and in the interests of all countries’, ‘due regard’, and when read with the above provisions, clearly, the agreement forbids commercial harvesting of space minerals; leaving such exploitation to be governed by a framework that will be determined in future.

Commercial exploitation of resources on the Moon and other Celestial Bodies was envisioned under Article 11, to be permitted by the establishment of a legal regime when such exploitation becomes feasible.<sup>93</sup> The purpose of this provision seems to accommodate future needs by leaving the issue for negotiations and determination as and when the feasibility of space mining, arises. At the time of drafting of the Moon Agreement, commercial space mining or other commercial exploitation was not a matter of concern, as supporting technology was not existent. Recent developments indicate that the time is ripe for the establishment of a commercial exploitation regime.

Further, Article 11 lists four principles in subsection 7, that shall form the basis of the future regime, namely,

- a. Orderly and safe development of natural resources,
- b. Rational management of those resources,
- c. Expansion of opportunities in use of those resources, and
- d. Equitable sharing of those resources.

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<sup>90</sup> Article 11(3)

<sup>91</sup> Article 6(1)

<sup>92</sup> Article 6(2)

<sup>93</sup> Article 11(5)



This provision indicates that the purpose of the Moon Agreement is not wholly restrictive to the commercial space mining; instead it tries to fit commercial activities within established principles as under the OST. ‘This provision thus contains a balanced definition of the notion of equitable sharing of benefits as it proceeds from the assumption that equity is impossible without special consideration of the efforts of States which have contributed to resource exploitation activity on the Moon’.<sup>94</sup> The four principles listed above could serve as broad guidelines in developing a future regulatory framework. Negotiating States will not be bound to follow these principles to the tee while creating a new framework, nevertheless, the underlying ideas are already embodied in the OST provisions.

Further, although, it seems that the Moon Agreement prohibits commercial mining, academic discussions have greatly contributed to clearing some uncertainties, which project the provisions therein in a different light. The status of resources removed from the Moon and celestial bodies is an issue of relevance. Christol opines that:

*“...by the introduction of the term ‘in place’ in Article 11(3), the negotiators intended to legalize the removal of natural resources from the surface or the subsurface of the Moon thereby establishing the right of ownership and of property in the possessors of such resources”.*<sup>95</sup>

Galloway reiterated this opinion stating that:

*“those who explore, use or exploit resources... may remove them from where they are located and have property rights over them... Exploiters cannot have property rights over the surface or subsurface or natural resources in place, but when substances are removed, they may have property rights”.*<sup>96</sup>

Tronchetti identifies, on an analysis of the travaux préparatoires<sup>97</sup> of the

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<sup>94</sup> Judge Helmut Turk, *The Negotiation of the "Moon Agreement"*, SPACE LAW SYMPOSIUM 2009, 30th Anniversary of the Moon Agreement: Retrospect and Prospects, at 8.

<sup>95</sup> Supra, note 78 ,at 262-263.

<sup>96</sup> E.Galloway, *Status of the Moon Treaty*, Space News 3-9, 1998 at 21.

<sup>97</sup> U.S.position in the working paper n.15, 1973, presented during negotiations, reaffirmed in 1979,

Agreement, that the term ‘in place’ was inserted with the specific purpose to allow the creation of property rights over the resources once removed from their original location.<sup>98</sup> Going by the consensus amongst space academia and the intention of the drafters of the Moon Agreement, it may be concluded that property rights exist over extracted resources; However, such an interpretation ought not to dilute the principles laid down in Article 4, lest it defeats the purpose of the Agreement. In that sense, commercial exploitation is valid as long as there is adherence to these principles. Any clarification should thus lay importance to balancing the interests of the entrepreneurs with these principles.

### **2.3.2.1 Common Heritage of Mankind**

Article 11 holds the most controversial notion of the ‘Common Heritage of Mankind’. According to this notion, ‘the exploration and exploitation of a certain area and its resources shall be carried out in accordance with the rules established by an international regime or authority, [there is an obligation] to conform to the international regime and to share the benefits derived from their exploitative activities’.<sup>99</sup>

On one side of the spectrum, developing nations, some of whom are Parties to the Agreement, believe that adherence to this concept will bridge the divide between States; whereas developed nations, mostly space powers deem this concept to be detrimental to their economic aspirations. These differences have singularly been the cause of the poor ratification and subsequent failure of the Moon Agreement. Between 2000 and 2002, the

International Law Association (ILA), had considered proposals and amendments to existing space law instruments to analyze the latter’s suitability for commercial space activities. Pursuant thereto, in 2002, F.G. von der Dunk, had suggested,<sup>100</sup> at the 70<sup>th</sup> Conference of the ILA, the removal of the term ‘Common Heritage of Mankind’ and replacing it with ‘Province of All Mankind’, to make the Agreement acceptable to States. On the contrary, Stephan Hobe’s suggestions to maintain status

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UN.Doc. A/AC.105/P.V.203, at 22.

<sup>98</sup> Supra, note 54, at 173.

<sup>99</sup> Supra, note 54, at 27.

<sup>100</sup> Proposal of the Special Rapporteur, International Law Association, Report of the 70<sup>th</sup> Conference, 2002, pp 13-16.

quo and inclusion of licensing and procedural guidelines, received support and were incorporated in the text of the Resolution 1/2002. The latter suggestion owes its acceptance to the changing concept of the ‘Common Heritage of Mankind’ notion. The 1996 Declaration on Space Benefits is proof of the dilution of States’ obligation to share benefits. Further, in 2008, a Joint Statement<sup>101</sup> by parties to the Agreement was made to encourage adherence to the Moon Agreement by clarifying some of the provisions of the Agreement. A Joint Declaration is also expected to address the exploitation of the natural resources of celestial bodies.<sup>102</sup>

Intensifying efforts towards the commercialization of space are challenging again, the validity and the future of the Moon Agreement. Certainly, the legal value of the Moon Agreement pales in comparison with the other space treaties. Nevertheless, there exists an aspiration to make it work. Strict reliance on the CHM principle will work as a detriment to the development of a future regime for the exploitation of resources in outer space. However, history speaks for itself and man needs to be bound by such notions to preserve an environment as valuable as outer space for future generations. Despite its shortcomings, the Moon Agreement provides for a good governance structure. Whether a legal regime adhering to the principles set out therein will pan out is a question for time to answer.

## **2.4 The American Dream<sup>103</sup>**

A majority of the space entrepreneurs, if not all, are based in the U.S.A. The efforts and aspirations of companies like Planetary Resources and Deep Space Industries to locate and mine Earth approaching asteroids for their resources, saw the tabling of the American Space Technology for Exploring Resource Opportunities in Deep Space (ASTEROIDS) Act,<sup>104</sup> was introduced on 10<sup>th</sup> July, 2014, by Representatives Bill Posey, and Derek Kilmer. The Act designed to protect the private property rights for entities mining asteroids and to otherwise encourage asteroid mining, has been referred to the Committee on Space.

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<sup>101</sup> UN Doc.A/AC.105.C.2/L.272, submitted by Austria, Belgium, Chile, Mexico, Netherlands, Pakistan, and Phillipines.

<sup>102</sup> Rene Lefeber, *Relaunching the Moon Agreement*, Space Policy, March 2015.

<sup>103</sup> A national ethos of the United States, a set of ideals in which freedom includes the opportunity for prosperity and success, achieved through hard work in a society with few barriers.

<sup>104</sup> H.R.5063—113th Congress (2013-2014), at <https://www.congress.gov/bill/113th-congress/house-bill/5063/all-info>.

Meanwhile, the Spurring Private Aerospace Competitiveness and Entrepreneurship Act of 2015 or the SPACE Act of 2015,<sup>105</sup> was passed in the House of Representatives. The U.S Senate has now referred the bill to the Committee on Commerce, Science, and Transportation. On 19<sup>th</sup> March, 2015, Space Resource Exploration and Utilization Act,<sup>106</sup> was introduced and referred to the Science, Space and Technology Committee of the House of Representatives; On 15<sup>th</sup> June 2015, the U.S. House of Representatives took a major step in passing a bill. An identical bill has been introduced into the U.S.Senate also.<sup>107</sup> The scope of this Act covers space resources, including resources in asteroids.

Essential Features:

The objectives of the Act have been enumerated in Section 51302 to include: the facilitation of commercial exploration and utilization of space resources to meet national needs; the discouragement of government barriers to the development of industries in manners consistent with the existing international; and the promotion the right of United States commercial entities to explore and utilize resources, free from harmful interference, and to transfer or sell such resources. Then, it requires the allocation of responsibilities relating to the exploration and utilization of space resources among Federal agencies. Section 51303 provides for a legal framework. Controversially, it establishes property rights by stating that “*Any asteroid resources obtained in outer space are the property of the entity that obtained such resources, which shall be entitled to all property rights thereto, consistent with applicable provisions of Federal law*”.

Dispute settlement, between two U.S. entities, is to be carried out by granting exclusive jurisdiction to the District Courts of the U.S to entertain civil action for relief from harmful interference.

#### **2.4.1 Legal Value**

Firstly, the U.S is a State Party to the OST, which prohibits it from ‘national

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<sup>105</sup> H.R.2262-114th Congress (2015-2016), at <https://www.congress.gov/bill/114th-congress/house-bill/2262/actions>

<sup>106</sup> H.R.1508—114th Congress (2015-2016), at <https://www.congress.gov/bill/114th-congress/house-bill/1508/text>, also encompassed as Title II of the SPACE Act, 2015

<sup>107</sup> Michael Salla, *US Congress To Protect Slave Labor On Mars & Corporate Space Colonies*, Exopolitics Research, Secret Space Programs, June, 2015.

appropriation by claim of sovereignty, by means of use or occupation, or by any other means'.<sup>108</sup> Under international law, property rights derive from States. In fact, in order to exist, property rights require a superior authority, a State, entitled to attribute and enforce them.<sup>109</sup> This bill does not distinguish between resources in situ and those that are extracted. While so, an attempt to vest rights in private entities or authorize its subjects to lay claim over matter that is not within the jurisdiction of a State will result in conflicts. Virgiliu Pop states that 'State endorsement of private appropriation [of spatial areas] would be a form of national appropriation'.<sup>110</sup> The extension of its territorial jurisdiction to outer space is a clear violation of Articles I and II of the OST. As stated earlier, there is a favourable tilt in the consensus over the exploitation and rights over extracted minerals, however, until it is concretely determined, any attempt by a State to authorize private activities in commercial space mining will result in conflicts. Thus, 'any [U.S.] attempt to confer property rights over asteroid resources to its private companies would indirectly signify that the U.S. attributes to itself ownership over those resources',<sup>111</sup> in the absence of

Secondly, the Bill does not provide for any specific licensing regime yet. Conducting space activities without a license is unprecedented in U.S. Space Law.<sup>112</sup> 'The license requirement imposed on the licensee that it maintain operational control, ,,is an implementation of the U.S. obligations under the UN Outer Space Treaty of 1967'.<sup>113</sup> Without a proper licensing regime, the U.S. will be in violation of the duty imposed by Article VI of the OST to authorize national space activities. In its present state, the bill is merely a step of encouragement for space entrepreneurship. The nature and scope of 'authorization and continuing supervision' essentially determined by applicable national laws and regulations, depending upon the politico- economic regulatory policies of each State, but, it is

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<sup>108</sup> Article II OST.

<sup>109</sup> Virgiliu Pop, *Appropriation in outer space: the relationship between land ownership and sovereignty on the celestial bodies'*, Space Policy 2000; 16: 275-281;

<sup>110</sup> Virgiliu Pop, *The Men Who Sold the Moon: Science Fiction or Legal Nonsense?*, 17 SPACE POLICY

<sup>111</sup> Fabio Tronchetti, *Private property rights on asteroid resources: Assessing the legality of the ASTEROIDS Act*, Space Policy 30 (2014), pp. 193-196.

<sup>112</sup> Letter from Dr. Gabrynowicz, Review Statement, H.R.1508, May 2015, at <http://democrats.science.house.gov/sites/democrats.science.house.gov/files/documents/HR%201508%20Gabrynowicz%20Comment%20May%2012%202015.pdf>

<sup>113</sup> 15.C.F.R Section 960 at 244777 (2006).

essential that the law is subject to applicable international law rules.<sup>114</sup> The law needs to be elaborated further, in order to efficiently regulate commercial space mining.

Thirdly, the Bill fails to foresee and address a situation of conflicting claims and national legislation from other space-faring nations. This unilateral action, disregarding the interests of other State Parties is a fertile ground for potential international conflicts.

Finally, if there is a conflict between the U.S. Constitution or a Federal statute, and a treaty, the Constitution or statute prevails. If this bill is brought into force, and there is a conflict, then it will have priority over the OST. The bill is premature to be a comprehensive framework to regulate space mining. While so, the legal hierarchy itself is in conflict with a rule of international law, i.e. a national law is no defense in avoidance of international obligations. While the bill intends to adhere to international duties and obligations, the actual international duties and obligations as regards to space mining are still unclear. In the case of a breach of the international obligations erga omnes, under the OST, any non-injured state is entitled to invoke the responsibility of the U.S.<sup>115</sup>

As for now, this Bill is not the State position of the U.S. It remains to be seen how the Bill moves forward and comes into force. States are the prime bearers of obligations under International Space Law. One can only hope that they exercise caution and consideration in the exercise of their rights. Commercial exploitation of space should not instigate international conflicts even before its materialization.

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<sup>114</sup> Ram Jakhu, *Implementation of Art VI of Outer Space Treaty in North America, the Third*, Eilene M. Galloway Symposium on Critical Issues in Space Law, December 2008.

<sup>115</sup> Article 48, International Law Commission, *Draft Articles on Responsibility of States for Internationally Wrongful Acts*, November 2001, Supplement No. 10 (A/56/10), chp.IV.E. 1

## CHAPTER 3

### LOOKING FOR A SOLUTION IN COMPARABLE LEGAL SYSTEMS

#### 3.1 Introduction

During the years of legislation of space law, ‘the main thrust of space activity was science and exploration’,<sup>116</sup> therefore, ‘the anticipated benefits were an expansion of the scientific knowledge base and spin-off technologies.’<sup>117</sup> Not much thought was given to serious enterprise and entrepreneurial activity in space.<sup>118</sup> The problems of human and international relationship are essentially old and persistent ones; it is the milieu, which is new. The interactions of the old problems in the constraints of the new settings are what challenge us.<sup>119</sup> The legality of extraction of resources from areas that do not fall within the jurisdiction of any States is an old issue that has been addressed in different settings in the last few decades. International efforts have been invested in developing legal regimes to govern and regulate the exploitation of ‘global commons’<sup>120</sup> such as the deep sea bed, Antarctica etc. The lessons from the success and failure of these legal regimes will aid in the development of a regime that regulates commercial space mining.

#### 3.2 Deep Sea Bed Regime

A Law of the Sea evolved from being customary international law to a codified law with the adoption by the First UN Conference on the Law of the Sea, of four Conventions at Geneva in 1958. These Conventions dealt with States’ duties and right in respect of different maritime zones. Having parallels to the OST, at the time of adoption of these laws, the drafters did not envisage exploitation of the deep sea bed for mineral resources. The mid 1960s saw increased interest from U.S

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<sup>116</sup> Supra, note 84, at 95.

<sup>117</sup> Id.

<sup>118</sup> C.Q.Christol, *Development of Current Outer Space Law, Symposium on Commercial Opportunities in Space: Roles of Developing Countries*, Taipei, Taiwan, China (1987).

<sup>119</sup> Supra, note 25.

<sup>120</sup> Peter Dauvergne, (ed.) *Handbook of Global Environmental Politics*, 2nd edition, EEP, 2012.

mining industries to extract minerals from deep sea bed nodules. This triggered other States also to consider deep seabed exploitation. States began to discuss about international control and management of the seabed.<sup>121</sup> In 1967, the UN Permanent Representative of Malta, Arvid Pardo, proposed that the new regime of the deep ocean floor be taken up as an agenda at the 22<sup>nd</sup> session of the UN General Assembly. He further proposed recognition and application of the ‘Common Heritage of Mankind’ principle to the deep seabed, use of the seabed only for peaceful purposes, and the establishment of an international regime for its exploitation and benefit-sharing thereafter.<sup>122</sup> Subsequently, in 1970 these principles were embodied in the ‘Declaration of Principles Governing the Sea Bed and Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction’.<sup>123</sup> The Resolution left unsolved, issues relating to the nature of the international regime, the sharing of benefits, and the existence of a moratorium on exploitation pending the establishment of a regime.

Disagreements on the practical application of the CHM principle began in early 1980 as the developed and developing States began to have divergent views. Access to the area, the role of an entity called the Enterprise, transfer of technology to the entity and developing States comprised the controversial issues. A big blow to the development of the Convention on the Law of the Sea came in the form of the Deep Sea Hard Mineral Resources Act, enacted by the US Congress. The Act provided for licensing and certification of Parties wishing to mine, and required that all international agreements guarantee US citizens access to the seabed.<sup>124</sup> This law was to be put in hold until 1988 after objections arose from other States. This interim domestic legislation was to function until an international regime to exploit the seabed resources was put in place. The rules for pioneer investors in the form of restraints on mining the sea bed, funding of the international entity ‘Enterprise’, inequitable benefit sharing, anti-competitive market planning etc.,<sup>125</sup> did not seem to commensurate with the investments of developed States. This lack of incentive to mine and excessive interference was met with refusal from the United States and

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121 UNGA Resolution on Permanent Sovereignty over Natural Resources UNGA Res. 1803(XVII)1962 and Declaration on the Establishment of a New International Economic Order UNGA Res.3012 (S-VI) 1974.

122 Theodore Kronmiller, *The Lawfulness of Deep Seabed Mining*, Vol I, NYOP, 1980 at 21.

123 Resolution 2749, 25 UN GOAR Supp. (N.28) at 24, UN Doc.A/8097 (1970).

124 Supra, note 54, at 73.

125 Id



United Kingdom to sign the final Act. The opinions of the developed and developing nations as regards the CHM principle and the international regime for seabed exploitation were set at different ends of a spectrum.

Subsequently, Germany, Britain, France, Japan and Italy also enacted domestic legislation similar to the U.S. law for deep-sea mining. Provisions for reciprocal recognition in domestic legislation created the legal basis for the establishment of the Reciprocating States Regime<sup>126</sup> or the mini-treaty regime. There was no published agreement, however, its objective was to resolve issues of conflicting claims, interference, payment of levy. This was assumed to be an interim measure pending the coming into force of the Convention on the Law of the Sea.

Gradually, there was a need - complemented by consensus, to establish a universal regime to govern deep-sea mining. This led to the dilution of the original notion of CHM to one that would be acceptable to most States. As a result, in 1994 the Implementation Agreement<sup>127</sup> was adopted, modifying the controversial Part XI of the Law of the Sea Convention, which establishes rules and procedures governing the exploitation of deep seabed resources. Accordingly, the International Seabed Authority was established, removing the strict stipulations as envisaged for the 'Enterprise'; the provision for mandatory transfer of technology was replaced with competitive market approach; the decision-making process was simplified to favour high-value investors; commercial principles were to apply to mining activities, weakening the benefit sharing principle; and timed exploration approvals were to be given, amongst other things.

The exploitation system envisaged in the Law of the Sea Convention, overseen by the International Seabed Authority, came to life with the signature in 2001/02 of 15-year contracts with seven organizations that had applied for specific seabed areas in which they were authorized to explore for polymetallic nodules. The adoption in 2000 of the Mining Code, regulations governing exploration for polymetallic nodules, has been the main legislative accomplishment of the ISA.<sup>128</sup>

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<sup>126</sup> Mark S. Bergman, *The Regulation of Seabed Mining Under the Reciprocating States Regime*, *American University Law Review*, Vol. 30, (1981) at 483.

<sup>127</sup> Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, entered into force on, 28 July 1996, UN Doc. A/RES.48/263.

<sup>128</sup> UNCLOS and the International Seabed Authority, at <http://iasips.in/unclos-international-seabed-authority>.

Significantly, the Code also includes provisions to deal with the protection of the marine environment and protection of data supplied by mining contractors. The number of contracts is steadily rising and the Authority is in the process of recognizing other seabed minerals and developing rules for their exploitation. Further, there is increasing interest in the exploitation of resources in the Arctic Ocean too.

Later developments in the UNCLOS incorporated some elements from the U.S Act, which is still used to authorize private entities subject to its State, by making amendments to accommodate industry interests. Further, it mentions in a clear manner a disclaimer of extraterritorial sovereignty, and licensing procedures.<sup>129</sup> This act also mentioned reciprocal recognition rights of other States, in accessing, exploring and exploited seabed mineral resources. Although commercial deep seabed mining is yet to reach its active potential, four licenses have been issued under the Deep Seabed Hard Mineral Resources Act for exploration of seabed areas in the Clarion- Clipperton zone of the South Pacific ocean.<sup>130</sup>

While so, contrary to expectations that seabed mining would generate extensive revenues for both the exploiting countries and the Authority, no technology has yet been developed for gathering deep-sea minerals at costs that can compete with land-based mines. Until recently, the general trend is that economic mining of the ocean depths might take a while to mature<sup>131</sup> as a majority of the work conducted by the ISA and States have been in relation to exploration. Moreover, the United States, with some of the most advanced ocean technology in the world, has not yet ratified the Law of the Sea Convention and is thus not a member of the Authority.<sup>132</sup>

In summary, the historical evolution of the regime, as elucidated above, demonstrates several similarities to subject of this study. It almost seems like the

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<sup>129</sup> Deep Seabed Hard Mineral Resources Act 1, As Amended Through P.L. 107273, Enacted November 2, 2002, at <http://legcounsel.house.gov/Comps/seabed.pdf>

<sup>130</sup> Id.

<sup>131</sup> So far, diamonds have been mined from the seabed by De Beers and others. Two Australian companies, Nautilus Minerals Inc and Neptune Minerals are planning to mine the offshore waters of Papua New Guinea and New Zealand by the end of 2015, available at <http://technology.infomine.com/articles/1/99/deep-sea-mining.undersea-miners.black-smoker/deep-sea.mining.and.aspx>

<sup>132</sup> UNCLOS and the International Seabed Authority, at <http://iasips.in/unclos-international-seabed-authority>.

space and sea regimes are running parallel, with the international community merely retracing its steps, now considering the U.S' 2015 Bill on Space Resource Exploration and Utilization Act, being similar to its 1980 Deep Sea Hard Mineral Resources Act. The success of the regime for deep seabed exploitation cannot be assessed until sea mining industry attains maturity. Nevertheless, it may still be a strong basis for developing the future space exploitation regime.

### 3.3 Antarctic Regime

The International Geophysical Year (IGY) of 1957-58 saw the establishment of over 50 scientific and research stations in Antarctica the hitherto uninhabited region of the world. At that time, twelve countries<sup>133</sup> had significant interests in the region. <sup>134</sup> Subsequently, Argentina, Australia, Chile, France, New Zealand, Norway and UK made sovereign claims over sections of the continent on the basis of discovery, proclamation, proximity, and occupation.<sup>135</sup> In need to preserve the fragile Antarctica environment led to the adoption of the several agreements constituting the 'Antarctic Treaty System':

- The 1959 Antarctic Treaty<sup>136</sup> and Recommendations<sup>137</sup>,
- The 1972 Convention for the Conservation of Antarctic Seals,<sup>138</sup>
- The 1980 Convention for the Conservation of Antarctic Marine Living Resources,<sup>139</sup>
- The 1988 Convention on the Regulation of Antarctic Mineral Resource Activities,<sup>140</sup>

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<sup>133</sup> Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, the United Kingdom and the United States.

<sup>134</sup> Antarctic Treaty, *The New Encyclopedia Britannica*. Chicago: Encyclopedia Britannica Inc., 15th edn., 1992, Vol. 1, at 439.

<sup>135</sup> Donald Rothwell, *The Polar Regions and the Development of International Law* (1996) pp. 54 - 58

<sup>136</sup> Entered into force 23 June 1961, 402 UNTS 71.

<sup>137</sup> Article IX(1) provides that measures may be taken for the 'furtherance of the principles and objectives of the Treaty.' When the measures are approved by the Antarctic Treaty Consultative Parties they become recommendations. The subject matter of recommendations is outlined in art IX(4).

<sup>138</sup> Entered into force 11 March 1978, 1080 UNTS 175.

<sup>139</sup> Entered into force 7 April 1982, 1329 UNTS 247.

<sup>140</sup> Opened for signature 2 June 1988, 27 ILM 868 (1988) (not yet in force).

- The 1991 Protocol on Environmental Protection to the Antarctic Treaty.<sup>141</sup>

The Antarctic Treaty embodied the principle of ‘Common Heritage of Mankind’, non-appropriation<sup>142</sup> and introduced novel elements of international law, such as the use for peaceful purpose,<sup>143</sup> promotion of international cooperation, consultations and exchange of information,<sup>144</sup> and freedom of scientific research, that were later incorporated into the OST. Further, it also devised a dispute settlement mechanism.<sup>145</sup>

The Antarctic Treaty establishes a hierarchy to govern Antarctica. Article IX creates three different groups of state parties, only two of which are entitled to attend Antarctic Treaty Consultative Meetings.<sup>146</sup> These are the twelve states that negotiated the Antarctic Treaty, and those states that have acceded to the Antarctic Treaty and fulfilled the requirements outlined in Article IX(2). Both of these groups comprise the Antarctic Treaty Consultative Parties (ATCPs). The third group consists of those states that have acceded to the Antarctic Treaty but have not fulfilled the requirements of Article IX(2). This situation has invoked criticisms relating to the management of Antarctica. Many states view the ATCPs as a ‘self-designated exclusive club without any clear legal authority to manage Antarctica for the rest of mankind’.<sup>147</sup> This led to the involvement of the UN in 1985 after Malaysia introduced a resolution requesting the ATCPs to make information regarding Antarctica generally available to the UN.<sup>148</sup>

### 3.3.1 Mineral Exploitation

The Protocol for Environmental Protection declares that:

*“Any activity relating to mineral resources, other than scientific*

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<sup>141</sup> Opened for signature 24 April 1991, 30 ILM 1461 (1991) (not yet in force).

<sup>142</sup>The 1959 Antarctic Treaty, Article IV.

<sup>143</sup> Id, Article I

<sup>144</sup> Id, Article IX.

<sup>145</sup> Id, Article XI.

<sup>146</sup>Supra, note 137, at 86.

<sup>147</sup>Christopher Joyner, *Governing the Frozen Commons: The Antarctic Regime and Environmental Protection* (1998) at 249.

<sup>148</sup> Question of Antarctica, GA Res 40/156, UN GAOR, 40th sess, 117th plen mtg, Supp 53, UN Doc A/RES/40/156 (1985)

*research, shall be prohibited”.*<sup>149</sup>

Article II designates Antarctica as a natural preserve devoted to peace and science. This is supported by Article III that prescribes fundamental consideration of the above principles in the carrying out activities, through an impact assessment. A Committee for Environmental Protection was also established to advise State parties as and when required. As of 2015, there are 6 Annexes to the Protocol to address emerging issues. Further, Article 25 places the ban on mineral exploitation for 50 years, until 2048. This system, however, is a postponement of a legal solution in comparison to the Convention on the Regulation of Antarctic Mineral Resources Activities, which would have established a body similar to the International Seabed Authority. The prohibition on mining is in contrast to the purpose of part XI of UNCLOS, as both the Antarctic Treaty and the OST have left issues unresolved for future deliberation and development.

Although that is the current rule, the Consultative Parties negotiated in the 1970s and 1980s (before the Protocol was adopted) a regime for the exploitation of the mineral resources of Antarctica. This is the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA), which was signed in Wellington on June 2, 1988.<sup>150</sup> Similar to the deep seabed situation, subsequent to the adoption of the Antarctic Treaty, the issue of mineral exploitation sought attention. However, several nations raised strong objections, and the convention was short-lived. Ensuing consultative party meetings on the Antarctic Treaty in Paris (1989) and Chile (1990) overturned the CRAMRA agreements and called for a complete and permanent ban on all mineral-resource activities in Antarctica.<sup>151</sup> Despite the failure of this Convention, it presents a model whose elements can be inserted into a legal regime for outer space and also shows the mistakes to be avoided.<sup>152</sup>

### **3.3.2 Core Provisions**<sup>153</sup>

The Convention defined Antarctic mineral resource activities to mean prospection, exploration or development, to the exclusion of scientific research

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<sup>149</sup>Article 7, The 1991 Protocol on Environmental Protection to the Antarctic Treaty.

<sup>150</sup>[http://www.ats.aq/e/ats\\_other.htm](http://www.ats.aq/e/ats_other.htm)

<sup>151</sup><http://www.britannica.com/place/Antarctica/Post-IGY-research#ref390221>

<sup>152</sup>Supra, note 54, at 116.

<sup>153</sup>[http://www.ats.aq/documents/recatt/att311\\_e.pdf](http://www.ats.aq/documents/recatt/att311_e.pdf)

activities within the meaning of Article III of the Antarctic Treaty.<sup>154</sup> Accordingly, mineral resource activities were to take place in three stages. Article 2 laid down the objectives to include the use for peaceful purposes in the interest of the international community as a whole, with due regard to the environment and in application of anti-monopolistic principles for exploitation. Pursuant thereto, it established an Antarctic Mineral Resource Commission, a Regulatory Committee, a special meeting of Parties, and a Scientific, Technical and Environmental Committee. Articles 2, 3, and 4 prescribed a system for environmental protection by requiring a preliminary environmental impact assessment; this was to be considered by State Parties to arrive at a positive decision if the proposal did not seem to cause any adverse effect to the environment. Further, the Commission was vested with the power to designate protected areas where no exploitation can be carried out. Article 8 of the Convention elaborates on responsibility and liability. Strict liability is laid on the operator and the State. A State's liability is maximum at the stage of prospective. Thereafter, the operator assumes the liability, greatly limiting that of the State. This is a clear identification of responsibility in relation to the activities undertaken. The Convention also details a dispute settlement mechanism. The leading principle emerging from these Articles is that the status quo ante of Antarctica must be preserved despite the undertaking of mineral resource activities.<sup>155</sup>

France and Australia rejected this Convention because of environmental concerns and as for the other States, the detailed procedures on prospection, exploration prior to the development acted as low economic incentives. Its failure can further be attributed to the complex institutional machinery and lack of adequate opportunities for the developing nations. Nevertheless, the provisions discussed above have a bearing on their application to outer space as well and thus, the Convention may effectively guide the space regime for mineral exploitation.

In summary, unlike the outer space, States have previously made sovereign claims over Antarctica and there is a prohibition on mineral exploitation. The creation of the ATCPs was established prior to the common heritage of mankind principle. It is subject to the criticism that it does not represent equitable

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<sup>154</sup> Article 1(7), Convention on the Regulation of Antarctic Mineral Resource Activities, 1988

<sup>155</sup> *Supra*, note 54, at 108.

management; the establishment of a management regime that differentiates between states, and limits their participation, does not represent an equitable model of management.<sup>156</sup> Yet, the Antarctic Treaty regime is effective, as it has resulted in international cooperation. It also demonstrates the processes of crystallisation that may occur when development dictates a legal regime.<sup>157</sup> It may not present a workable standard, however there do exist elements for consideration in the future development of the mining regime in outer space.

### 3.4 Geostationary Orbit (GSO) Regime

The GSO is an imaginary circular orbit about 35000 kilometres above the Earth's equator, following the direction of the Earth's rotation. An object in such an orbit has an orbital period equal to the Earth's rotational period and thus, appears motionless, at a fixed position in the sky, to ground observers.<sup>158</sup> Therefore, this orbit is strategic for commercial telecommunication satellites. Satellites are placed in orbital locations and are allocated frequencies for space communications services. In this respect, the GSO is an in exhaustible, yet limited natural resource<sup>159</sup> as only a certain number of satellites can be placed in this orbit without the risk of congestion or signal interference.<sup>160</sup>

The International Telecommunication Union, a specialized agency of the UN, began to address space communications in 1959. In 1963 at the Extraordinary Administrative Radio Conference, it assumed the responsibility to allocate frequency bands for space radio communication purposes.<sup>161</sup> The application of terrestrial procedures and principles to orbital allocations on a 'first come, first served' basis or the 'a posteriori method' received opposition from States, who argued that eventually this resource would be exhausted even before some States could develop capabilities to reach space. This led to the debate of 'equitable access' to the GSO

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<sup>156</sup> Edward Guntrip, *The Common Heritage Of Mankind: An Adequate Regime For Managing The Deep Seabed? The Common Heritage Of Mankind*, Melbourne Journal of International Law, Vol 4, (2003).

<sup>157</sup> Id.

<sup>158</sup> Loo Kang Wee and Giam Hwee Goh, *A Geostationary Earth Orbit Satellite Model Using Easy Java Simulation* 2013 Phys. Educ, at 48, 72.

<sup>159</sup> Audrey L Allison, *The ITU and Managing Satellite Orbital and Spectrum Resources in the 21st Century*, Springer 2014, at 14.

<sup>160</sup> Recognised and set forth in Article 33 of the 1973 ITU Convention, Article 33(II) of the 1982 ITU Convention and Article 44 of the 1992 ITU Constitution.

<sup>161</sup> Supra, note 161 at 14.

based on Article I of the OST. This principle was codified in Article 33 of the 1973 ITU Convention which prescribed efficient and economic use of the frequency/orbit. Nevertheless, the fear of developing States was reflected in the Bogota Declaration,<sup>162</sup> claiming sovereignty over parts of the GSO and calling for international administration. This Declaration, though unsuccessful, drew attention for the systematic regulation in the use of the GSO. The 1985 and 1988 World Administrative Radio Conferences devised an ‘a priori allotment plan’ by reserving at least one orbital slot to all States, to satisfy their requirements for national communication services. Currently, there exist two procedures for allocation based on the above said approaches. Issues of paper satellites<sup>163</sup> and slot trading continue to challenge the system that seems to ‘sacrifice the efficient and economic use of a limited natural resource to reach the purpose of equitable access’<sup>164</sup> to the GSO for developing States.

Mining in space differs from the subject of regulation of the ITU in that the GSO though limited, is a renewable resource; There is no destruction of the GSO and the allocation method works as a recycler. Despite this, a consideration of the GSO Regime for application in space is constructive. The regime seems to balance economic security and equitable access through the dual allocation methods. Further, by ensuring efficiency in the use, it has so far achieved success in managing a limited resource.

### **3.5 Lessons for the Future**

Each of the regimes mentioned above applies to the distinct expanse it seeks to govern; evolving so as to accommodate the latter’s particular needs.

Yet, they are analogous to the issue in outer space; all regimes seek to govern exploitation of a common territory. In doing so, they are required to adhere to the principles of equitable access, benefit-sharing, due regard to the interests of other States, and protecting the territories from abuse and political conflicts. The criticisms on these regimes also share commonalities in that there is a divide between the

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<sup>162</sup> Declaration Of The First Meeting Of Equatorial Countries, Adopted on December 3, 1976, ITU Doc. WAERC-BS-81-E.

<sup>163</sup> Speculative applications in the ITU for satellite slots. Scrambling for Space in Space ITU Plenipotentiary to Tackle ‘Paper Satellite’ Problem, ITU Press release, 2002 at [http://www.itu.int/newsroom/press\\_releases/2002/21.html](http://www.itu.int/newsroom/press_releases/2002/21.html)

<sup>164</sup> Supra, note 54, at 139.



interests of the developed and developing States in the exploitation of the resources. Notwithstanding the limitations and failures of the above regimes, each renders valuable elements for consideration and incorporation in a future regime for exploitation of mineral resources in space. Unnecessary and futile exercises in the development of the future regime can be avoided to a great extent, if, the lessons learnt from the development and implementation of these analogous situations are deliberated.

## CHAPTER 4

### FROM EXPLORATION TO EXPLOITATION

#### 4.1 Need for a New Regime

The preceding Chapters accentuate the need for a legal regime for space mining. The idea of mining in space to supplement the depleting resources of the Earth for future missions and for use in Earth is promising. However, it gives rise to several legal questions. The existing space law regime is not equipped to deal with the challenges posed by commercialization, privatization and technological advancements. Nevertheless, the law does encourage future development as and when the time arises.

Although the core of space mining is comparable to mining on Earth, there are significant peculiarities as to the physical characteristics of outer space, the nature of human activities therein, and the probable impact of such activities. The application of analogous models to govern space mining may not succeed. However, it is possible to identify solutions from these models keeping in mind the unique elements of outer space.

When space mining capabilities materialize, the lack of a reliable legal and regulatory mechanism to govern the activity will result in several problems for the international community. The space mining industry is yet to make a start, but it is imminent. The absence of rules and lack of certainty in existing law is an impediment not only to the growth of this industry but also to associated science and technology. While it is argued that law-making for this industry is not urgent as the technological feasibility is yet to materialize, it is to be noted that it is the uncertainty of laws that are some of the stumbling blocks. The international community is grappling to deal with the various issues thrown by cyberspace, as the law failed to catch up the technological advancement. A cue should be taken from history to anticipate these developments. Further, as we progress from the

exploration of outer space to its exploitation, it becomes necessary to provide incentives to the exploiters and balancing that with the interests of the international community as a whole.

Particularly in space mining, ‘a regime will contribute to foster legal certainty among States and private companies and thereby stimulate them to devote their resources to the exploitation of the natural resources of the Moon and other Celestial Bodies’.<sup>165</sup> Political and legal understandings on the regulation of space activities between the nations supporting space ventures are as essential to continued, peaceful progress as is their economic support.<sup>166</sup> The vacuum in outer space economic development demands a new regime as soon as possible to prevent potential conflicts.

## **4.2 Founding Principles**

As for the realization of the international regime to govern the exploitation of natural resources in space, the possible options for legal action range, in principle, from laissez-faire to complete prohibition of all use of extraterrestrial materials.<sup>167</sup> The interpretation of economics and its application to and impact on the society is a dynamic exercise. The law that regulates this must also be as organic. No economic system or its regulation is perfect. The success depends on maintaining a balance. As regards, commercial space mining goes, such a balance can only be achieved by adhering to established and commonly understood principles as may be incorporated in the future regime.

### **4.2.1 Commercialization**

Mining in space is a great step for mankind that will possibly provide a large number of benefits. While so, economic pressure on the States must not lead them to make hasty decisions. There must be a careful consideration of the issues raised in the previous chapters.

*“Andrea: Science knows only one commandment — contribute to science. [...]”*

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<sup>165</sup> Supra, note 54, at 179.

<sup>166</sup> Supra, note 25.

<sup>167</sup> Supra, note 87, at 152.

*Galileo: To what end are you working? Presumably for the principle that science's sole aim must be to lighten the burden of human existence. If the scientists, brought to heel by self-interested rulers, limit themselves to piling up knowledge for knowledge's sake, then science can be crippled and our new machines will lead to nothing but new impositions.*"<sup>168</sup>

*"Oftentimes, the goal of achieving positive contributions to society is perceived as being in fundamental conflict with the restrictions many commercialization arrangements place on the use of knowledge... although commercialization may at times conflict with the goal of achieving positive contributions to society, it can also be complementary to pursuits towards societal contributions, or even a critical component in achieving the desired positive contributions to society".*<sup>169</sup>

The critical issue in the exploitation of common regions has been the extent of freedom given to the exploiters. The developed States and entrepreneurs assert that excessive control, complex bureaucratic structures, obligations to share benefits, etc, act as a disincentive for investors. On the other hand the developing nations want to reap the benefits of exploitation too and protect their future interests. A tilt in favour of either side, would reflect in the failure of the law, as can be seen from the Deep seabed and the Antarctic Regimes. The law must indeed favour the developed States to commensurate their investments but, at the same time, the interests of States yet to achieve space capabilities must not be compromised. In this respect, the ITU regime attempts to create a balance. Although, this does not completely establish equity in practice, the right to equal treatment and of opportunity is not denied to the developing States, keeping in line with Article I of the OST.

Further, the balance between commercialization and public good can be found in the concept of 'Intergenerational Equity'. Accordingly, humans 'hold the natural and cultural environment of the Earth in common both with other members of the present generation and with other generations, past and future'.<sup>170</sup> It means

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<sup>168</sup> Berthold Brecht, Galileo, Scene 14.

<sup>169</sup> S. Schillo, *Commercialization and Public Good: Conflict, Complement, or Critical Component?* Technology Innovation Management Review, 4(7), 2014 pp.27-35.

<sup>170</sup> Edith Brown Weiss, *In Fairness To Future Generations*, Environment, vol. 32, no. 3, Apr. 1990, at

that we inherit the Earth from previous generations and have an obligation to pass it on in reasonable condition to future generations.<sup>171</sup> This notion is of particular relevance not only to environmental protection but also as to resource usage between nations of differing prosperity. The logic of sustainable development would seem to require that each nation meet its own needs without reducing the ability of other nations to meet theirs.<sup>172</sup> Further, the ‘Precautionary Principle’, ‘which requires participants to examine potential outcomes seriously and to stop and engage in more intensive outcome examination if the environmental outcome appears either unknown or unfavorable’,<sup>173</sup> has developed over time to apply to not only environmental protection, but also risk and resource management. There is a possibility that some of the space activities pursued for exploration and exploitation of resources may result in unpredictable consequences to the environment or otherwise. Therefore, it will be significant to adopt this principle in regulating commercial space mining too.

#### 4.2.2 Nature of Outer Space Resources

Much has been debated about the legal status of the resources in outer space and the definition of rights over them. Companies that wish to mine in space contend that the absence of property rights prevents them from carrying forward their activities. Hertzfeld and von der Dunk, judge that these are premature concerns and fears of the entrepreneurs.<sup>174</sup> The lack of sovereignty and consequent call for appropriation rights in space would not clear all obstacles in space mining.

*“Property is a general term for the rules that govern people’s access to and control of things like land, natural resources, the means of production, manufactured goods, [...] Disagreements about their use are likely to be serious because resource-use matters to people. They are particularly serious where the objects in question are both scarce and necessary”.*<sup>175</sup> Property is commonly

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<sup>171</sup> Sharon Beder, *The Nature of Sustainable Development*, 2nd edition, Scribe, Newham, Vic., 1996, at <http://www.uow.edu.au/~sharonb/STS300/equity>.

<sup>172</sup>Id.

<sup>173</sup> Paul Larsen, *Application of the Precautionary Principle to the Moon*, 71 J. Air. L. & Com. 295 (2006).

<sup>174</sup>Supra, note 84, at 98.

<sup>175</sup> Jeremy Waldron, *Property and Ownership*, The Stanford Encyclopedia of Philosophy, Spring 2012, at <http://plato.stanford.edu/archives/spr2012/entries/property/>

recognized as being a "bundle" of disparate rights regulating relations between people with respect to things. The bundle of rights can be unpacked. It includes: the right to possess, the right to use, the right to exclude, and the right to transfer.<sup>176</sup> A combination of these rights also makes the possessor of such rights the 'owner' of the property in question. These rights are not on/off affairs; they can each be limited or expanded along a continuum.<sup>177</sup> Article I of the OST seems to vest usufruct rights that are limited by the term 'for the benefit and in the interest of all mankind'. In Roman-based legal systems, this concept is the temporary right to the use and enjoyment of the property of another, without changing the character of the property, applied in determining the property interests between a slave held under a *usus fructus* bond and a temporary master.<sup>178</sup>

In the development of an international regime, an authority of body governing mineral exploitation in space can assume the role of the temporary master, who will hold the property for the international community. This is similar to the right granted to satellite operators who are given usufruct rights over the GSO by the ITU, although, the rights are imperfect, as in practice slots are traded; there is economic value attached to the orbital positions/spectrum, yet, no appropriation can be made of the position. The non-appropriation principle embodied in Article II of the OST is sacrosanct. Calls to do away with this principle will be detrimental to international peace and security. Thus, as rightly observed by Hertzfeld and von der Dunk, property rights can exist without sovereignty, as 'ownership problems raised by international agreements have solutions not requiring a major change in existing space law, but rather carefully drafted additions and amendments to the current legal regime'.<sup>179</sup> This can be done by way of clarifying the non-appropriation principle rather than its removal and in identifying what property rights can be granted to entrepreneurs.

#### **4.2.3 International and Inter-Disciplinary Co-operation**

Space exploration encourages international cooperation for several reasons: As a branch of science and technology, space exploration is subject to some of the

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<sup>176</sup>Jesse Dukeminier And James E. Krier, *Property*, 3d Ed., 1993 at86.

<sup>177</sup>Ezra J. Reinstein, *Owning Outer Space*, 20 Nw. J. Int'l L. & Bus. 59 (1999-2000), pp. 72-73.

<sup>178</sup>Usufruct - Law, at <http://www.britannica.com/topic/usufruct>.

<sup>179</sup>Supra, note 84, at 82.

same trends. Space exploration being inherently scientific dismisses to a certain extent, national identity in favor of intellectual accomplishment. The International Space Station is the primary example of such international co-operation.<sup>180</sup> Linking fifteen European nations, the European Space Agency also offers a working model of scientific, technological, and political cooperation on an international scale.<sup>181</sup>

Article IX of the OST embodies the principles of ‘cooperation’, ‘mutual assistance’, ‘international consultations’, and ‘due regard’. The importance of these principles for the future exploration and exploitation of outer space have been understated. Space mining will see the convergence of efforts from various fields and demand for the extracted minerals will not arise from one State alone. Space mining, as stated earlier, involves several stages and types of activities. Broadly, it involves and requires the expertise of scientific and technical, legal, economics and management professionals. The complex nature of this activity, particularly when conducting it in space, requires cooperation amongst these experts. Consequently, this will help develop a strong and comprehensive regulatory framework, that has taken into account Therefore, there is a compelling need for international and interdisciplinary cooperation.

The future regime, ideally through an international body, should regulate commercial space mining in phases similar to the Antarctic regime: Prospection, Exploration and Development. Although this process might seem convoluted, it is necessary for the effective regulation of activities and management of resources. Simplified bureaucratic procedures that are time sharp will avoid the failure faced by the Antarctic regime. To satisfy the interests of the international community, procedures must be laid down for impact assessment, analysis of use of usufruct right, environmental preservation and protection, etc,. This must be complemented by detailed provisions laying down the responsibility and liability of States, entrepreneurs and operators. A regime is strong only when it encompasses an efficient dispute settlement mechanism and binding enforcement procedures. Considering the nature of outer space exploitation, much importance must be laid on such a mechanism to render teeth to the legal and regulatory framework governing

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<sup>180</sup>Daniel Beringer, March 2011, TedTalk USA at [http://www.ted.com/conversations/748/does\\_space\\_exploration\\_encoura.html](http://www.ted.com/conversations/748/does_space_exploration_encoura.html)

<sup>181</sup> Roger Bonnet, Vittorio Manno, *International Cooperation in Space: The Example of the European Space Agency*, Harvard University Press, 1994.

commercial space mining. Last but not the least, the regime should not be too rigid or too flexible; the framework should be devised in a way that it can accommodate future developments.

The benefits of the space industry are enjoyed by most, if not all of the nations in the world. It works on the rule of trickle-down economics. Not all States are space faring and even those that are, have varied capabilities. Yet, the benefits have percolated to even the States that have no intention now to participate in the space race. Recapping the evolution of the Deep Seabed Regime and the Antarctic regime, calling for mandatory transfer of technology or a share in profits, it can be deduced from practice that even without such stipulations, general space activities have been beneficial to all mankind. In these circumstances, a new regime, instead of stipulating mandatory benefit-sharing, can encourage through international co-operation knowledge and technology sharing between the developed and developing space nations. Left to the discretion of States, economic geopolitical situations would themselves lead to mutual assistance and sharing. The increasing trend to group efforts through regional organizations would further aid in benefit-sharing. As mentioned earlier, cooperation in outer space is easier than in terrestrial regimes.

In summary, the future regime will be an international governance structure in itself. This will mean that States, entrepreneurs, engineers and scientists, economists, and lawyers, will have to collaborate with each other in legislation, administration and dispute settlement. At this juncture, efficiency in commercial space mining can be achieved only with the observance of the principles embodied in Article IX of the OST. Although it may seem like a utopian suggestion, it is achievable.

#### **4.3 Making the Law**

The challenge in establishing a legal and regulatory framework for commercial space mining is how and by whom the law should be formulated rather than the actual formulation of the law. Several options lay before States now. The options can be most liberally classified into Soft Law and Hard Law. However, the structure of the space law system and the challenge posed by commercial space mining add several layers to this classification. Some of the possible options are discussed below:



### 4.3.1 Maintaining Status Quo

Although space mining activities have commenced, they are yet to take off. Actual exploitation of the Moon and celestial bodies in the form of extraction of resources may not happen in the near future. While so, until the industry develops further, status quo can be maintained without making any changes to the existing regime. The difficulty however is when there is a sudden development and the law becomes incompetent to regulate activities. The OST and international law in general relies on power politics as a mechanism to enforce adherence to the law. If an entrepreneur, for example, from the U.S., following its national legislation permitting space mining, undertakes such activities, it will be a complex situation requiring political solutions. The OST or Public International Law cannot settle the dispute relying on legal provisions alone. In a far shot, there is also the risk that such unopposed<sup>182</sup> and unrestricted activities would eventually lead to the development of customary international law.

### 4.3.2 Guidelines, Standards or a Code of Conduct

This may be the starting point for the future regime governing commercial space mining. An agreement made in the form of standards of practice, guidelines or a code of conduct are flexible and can be as effective as Treaty Law. Successful examples can be found in the guidelines developed by the Inter-Agency Space Debris Coordination Committee (IADC),<sup>183</sup> which prescribes voluntary rules for the mitigation of space debris; the international Standards and Recommended Practices (SARPs) established by the International Civil Aviation Organization<sup>184</sup> that are constantly updated for the efficient use, safety and security airspace and aviation; the UN-SPIDER<sup>185</sup> implemented as an open network of providers of space-based solutions to support disaster management activities; or the proposed Draft International Code of Conduct for Outer Space Activities,<sup>186</sup> to ensure space security in the conduct of activities.

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<sup>182</sup> Considering that very few countries have current capabilities to mine in space.

<sup>183</sup> UNGA Res. 62/217 (2007) in A/RES/62/217.

<sup>184</sup> The Convention on International Civil Aviation, 740 UNTS 21.

<sup>185</sup> United Nations Platform for Space-based Information for Disaster Management and Emergency Response, UNGA Res.61/110 of 14 December 2006 United Nations Platform for Space-based Information for Disaster Management and Emergency Response.

<sup>186</sup> European Union, March 31, 2014, at [http://www.eeas.europa.eu/non-proliferation-and-disarmament/pdf/space\\_code\\_conduct\\_draft\\_vers\\_31-march-2014\\_en.pdf](http://www.eeas.europa.eu/non-proliferation-and-disarmament/pdf/space_code_conduct_draft_vers_31-march-2014_en.pdf)

Such an agreement would establish uniformity in the conduct of commercial space mining activities, establishing for certain customary practices, with an option for future codification as hard law. It appears that the tested method of step-by-step resolution of emerging issues through non-binding instruments which are confirmed, at a later stage, by limited agreements dealing with particular matters is an essential prerequisite for successful lawmaking.<sup>187</sup> However, space mining is an activity that requires resolution of several intricacies. A simplified solution in the form of the above said agreements, unless devised in formal structures, will not be effective. Enforcement becomes problematic when compliance differs from State to State, as is the case with the examples given above.

### 4.3.3 Self-Regulation

Private industry regulation, similar to the systems in aviation or maritime areas is another option. 'The traditional government role in establishing safety regulations and certifying compliance is no longer suitable for highly advanced and fast evolving systems and operations. Rather, the commercial space community should take the lead in developing goal-oriented and performance-based safety standards and policies'.<sup>188</sup> Without a 'robust verification mechanism, a company may actually find itself in a riskier position, because now it may be confronted with accusations that it claimed to do something but then failed to deliver on it'.<sup>189</sup> Self-regulation has worked for industries such as aviation, marine transport, insurance etc.,. However, there is an equal amount of industries where it has failed such as food and beverage, fashion and more importantly mining, as can be judged from Australian and Canadian mining industry examples. Private industry decision making is economics oriented, even if an agreement is reached by consensus the balance would weigh heavily against public interests. Terrestrial examples of such self-regulation almost always result in anti-competitive, exploitative and abusive structures that seek government intervention. While certain matters such as benefit-sharing, extent of co-operation with developing States can be left to the discretion of

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<sup>187</sup>Gennady M. Danilenko, *Outer Space and the Multilateral Treaty-Making Process*, 4 Berkeley Tech. L.J. 217 (1989), pp.217-248.

<sup>188</sup> Michael J. Listner, Tommaso Sgobba, and Christopher Kunstadter, *Taking A Page From Maritime Practice To Self-Regulate The Commercial Space Industry*, at <http://www.thespacereview.com/article/2252/1>

<sup>189</sup> Michael Toffel, *Industry Self-Regulation*, Harvard Business School WK, April 2007 at <http://hbswk.hbs.edu/item/5590.html>.

the industry, important spheres such as environmental protections, standardization of procedures etc., should be regulated by an authority to whom the industry players will be accountable. Anyhow, the application of this option for outer space activities will be challenging considering that State authorization is a prerequisite under Article VI of the OST. The situation may change however, if the U.S law authorizing space mining comes into force.

#### **4.3.4 Treaty Law**

As stated in the previous chapters, outer space is not the ‘Wild West’. The OST and to a certain extent, the Moon Agreement do establish a rugged framework for exploitation in space. It does not inhibit private enterprise, it merely prescribes that commercial activities are not ultra vires the principles and notions set forth in the provisions therein. The ambiguous terms and their interpretation have indicated gaps to fit the sum of activities in commercial space mining. A new treaty law to regulate commercial space mining may be brought forth by making amendments or formulating protocols to existing law, formulating a new law based on existing models governing exploitation of common regions, or creating a completely new treaty.

##### **4.3.4.1 A New Treaty**

While the years between 1959 to 1979 saw the rapid growth of space legislation, thereafter, no new space treaties have been agreed upon. Any legislation has been informal through the adoption of non-binding guidelines, codes of conduct and UNGA resolutions and declarations. This can be attributed to the difficulty to reach a consensus at the UNCOPUOS and States’ reluctance to forgo national interests for ‘the interest of mankind’. Realistically, efforts to establish a regime for commercial space mining may follow the same pattern of adoption of non-binding instruments rather than the negotiation and adoption of a formal treaty. Further, a new Treaty may incorporate certain principles that deviate or dilute the established principles in the OST. The principles embodied in the OST are widely accepted by States, which is reflected in the number of ratifications;

moreover, they have the status of customary international law. The acceptance of a new Treaty that is essentially a modification or derogation of the principles in the

OST would be met with stiff opposition from the international community.

A new Treaty should elaborate on the existing principles to accommodate commercial space mining rather than contradict them. Negotiations and arriving at a consensus as an international community would be the most difficult stage. This may in turn lead to entrepreneurial space States to form a mini-treaty, which is more viable. However, its success is questionable. Even if a new Treaty is adopted there may be a possibility that it meets the same fate as the Moon Agreement, as States would continue to assert their rights based on their own interpretation of the existing law.

Nevertheless, the need of the hour is clarity and conciseness of the existing space law regime in its application to space mining. A new Treaty that address this need and/or provides a solution to the questions falling within the grey area of space law, would indeed be welcome.

#### **4.3.4.2 OST Revisited or Renegotiated?**

As mentioned above the OST and the principles therein have been widely accepted by the international community. Any attempt to renegotiate the treaty would result in a misadventure. A distortion of established principles will be adverse to the exploration and use of outer space. The alternative will be to clarify the position of the law by resolving ambiguities and/or enacting supplementary rules to regulate exploitation.

As economic, political, cultural, and technological realities change, there arises a need to interpret Treaties in a different light. Evolutive interpretation is an interpretation where a term is given a meaning that changes over time.<sup>190</sup> One of its main functions is to allieviate the need for new rules to address present concerns, the need for (but not necessarily the prevalence of) evolutive interpretations is comparatively greater in the international sphere.<sup>191</sup> The VCLT<sup>192</sup> Articles 31-33

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<sup>190</sup> The Joint Dissenting Opinion in *Feldbrugge v. The Netherlands*, ECHR (1986) Series A, no 99, 266, para 24.

<sup>191</sup> Sondre Torp Helmersen, *Evolutive Treaty Interpretation: Legality, Semantics and Distinctions*, European Journal of Legal Studies, Volume 6, Issue 1 (Spring/Summer 2013), pp. 127-148.

<sup>192</sup> Vienna Convention on the Law of Treaties entered into force 27 January 1980, 1155 UNTS 331, hereinafter the VCLT.

prescribe principles of treaty interpretation, which permit evolutive interpretation. In *Dispute regarding Navigational and Related Rights*<sup>193</sup>, the ICJ formulated a ‘general rule’ to determine when an evolutive intention ‘must’ be presumed:

*“(1) First, the parties have used ‘generic terms’ (in which case the parties have ‘necessarily [...] been aware that the meaning of the terms was likely to evolve over time’), and*

*(2) the treaty ‘has been entered into for a very long time or is ‘of continuing duration’”.*

Such an evolutive interpretation to the provisions of the OST may be undertaken by the UNCOPUOS, to establish an environment conducive for commercial space mining. However, adequate measures should be taken to ensure that well established principles are not deteriorated.

#### **4.3.4.3 Revisiting the Moon Agreement**

Article 18 of the Moon Agreement prescribes review of the Moon Agreement, ten years subsequent to its entry into force, to consider its revision in the light of its past application and taking into consideration any technological advancements. Periodically, debates have occurred to this effect, However, a more concrete effort is now underway in the form of the 2008 Joint Statement and a future Declaration from the Parties to the Moon Agreement. The approach to OST mentioned above, may also be used for the Moon Agreement, as it already has a structure for governance. The fact that certain provisions have been misinterpreted should not be the reason to discard the Moon Agreement in its entirety. The time is ripe for revisiting or renegotiating the Moon Agreement. The efforts of the State Parties to persuade major space-faring nations to adopt the Moon Agreement in a

revised format may be practical if concerted attempts are made to arrive at a solution. Renewed interest in Moon missions coupled with space mining aspirations will ensure that the Moon Agreement and its provisions are featured in the agenda of the UNCOPUOS and other international space fora for the next few years.

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<sup>193</sup>*Dispute regarding Navigational and Related Rights (Costa Rica v. Nicaragua)* [2009] ICJ Reports 213, para 64-66.

Subsequently, it may pave the way for the establishment of a regime as envisaged under Article 11 of the Moon Agreement.

#### **4.3.4.4 Adoption of Analogous Models**

Elements from analogous models as seen in Chapter 3, maybe adopted as a new law or incorporated as supplements to the OST or the Moon Agreement. The following elements from each of the regimes may be incorporated in a new framework:

- Deep Seabed Regime - Establishment of an International Regulatory Authority;
- Antarctic Regime - Stage wise mineral resource exploitation, impact assessment, environmental protection, analysis of resource use; and
- GSO Regime - Dual allocation or licensing method, usufructory property rights.

The above systems are comparable to the outer space and cater to the needs of commercial exploitation. They act as a valuable source of information for the effective implementation of a new regimes. The shortcomings of these regimes and the experiences of the international community will aid in establishing a regime that is apt for both the developed and developing space faring nations. Thus, the probability of a regime failure will be greatly reduced.

#### **4.4 Negotiating a Legal and Regulatory Framework**

Since the coming into force of the Outer Space Treaty, the State Parties have never held a meeting. Alternately, they have used various international fora, including the UNCOPUOS to represent their positions and grievances. As regards the Moon Agreement, the States party to it are few and do not play influential roles in the international space community. The UNCOPUOS and its Scientific and Technical and Legal Subcommittees operate on the basis of consensus, i.e. all delegations from member States must agree on any matter, be it treaty language before it can be included in the final version of a treaty or new items on Committee/Subcommittee's agenda.<sup>194</sup> The outcome of a regime for commercial space mining will affect all nations. Even otherwise, being *res communis*, a law that

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<sup>194</sup> Supra, note 17, at 3.

governs this sphere must take into account the interests and opinions of all the nations. A meeting of all States would bring out a lot of questions and indeed answers too, as there has been a change not only in circumstances but also the bargaining power of nations. 'Renegotiation is a strong indicator that governments are cognizant of the implications of treaty design, which was not always the case when they were initially concluded. It also suggests that states believe that design differences across treaties matter. At the same time, the phenomenon of renegotiation indicates that governments accept the general principles of the regime but wish to adjust specific rules'.<sup>195</sup> With growing innovation, space activities are transcending to a different and more advanced phase; A meeting at this juncture will reflect on the past to address concerns of the future. In practice however, this may not be possible. Then, the authority to negotiate an international regime for outer space, having universal ramifications, becomes open to discussion.

#### **4.4.1 Multilateralism**

Multilateral treaties have for long been an important source of international law and are an integral aspect of the rule of law at the international level. Space, in its initial years was the domain out to use by very few countries, most of which were super powers. After several decades, the situation is gradually improving, even though the space pioneers obviously have valuable advantage over the emerging or developing space faring nations. 'Consensus rule was adopted by the UNCOPUOS in 1962 and is considered to be a major achievement of this UN body. As a result, all multilateral treaties relating to outer space elaborated in the framework of the UNCOPUOS were adopted by consensus'.<sup>196</sup> Law making at this juncture have to face the challenge posed by the rising number of space-faring nations and consequently in convincing that number of nations to arrive at a consensus on a particular issue. In these circumstances, many space faring nations seem to believe that discussing a new space agreement or amendment of the Outer Space Treaty would be futile and time consuming, because entrenched differences regarding resource appropriation, property rights and other issues relating to commercial

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<sup>195</sup> Haftel & Thompson, When Do States Renegotiate International Agreements?, University of Maryland, Nov 2013 at [http://www.cidcm.umd.edu/workshop/papers/Thompson\\_CIDCM\\_2013.pdf](http://www.cidcm.umd.edu/workshop/papers/Thompson_CIDCM_2013.pdf)

<sup>196</sup> E.Galloway, *Consensus Decisionmaking by the United Nations Committee on the Peaceful Uses of Outer Space*, 7 Journal of SPACE Law, 3 (1979).

activity make consensus unlikely.<sup>197</sup>

The role of small States or in our case, developing space-faring nations in multilateral treaty making is arguable. On May 19, 2015, a discussion was held in New York on ‘Multilateral Treaty-Making: Perspectives on Small States and the Rule of Law’,<sup>198</sup> organised as a side event in preparation of the discussion of the Sixth Committee of the UN General Assembly on ‘The Role of Multilateral Treaty Processes in Promoting and Advancing the Rule of Law’. The course of the discussions laid overwhelming emphasis on the fact that the contributions of small States are equally important and valuable in the development of international law and norms, including in the making of multilateral treaties; this holds true even if small States face practical challenges in participating in the process of multilateral treaty-making. The forming of regional and other types of groups with a lead negotiator was one proven solution to the practical problems faced by small States in multilateral treaty negotiations, which include lack of financial and administrative resources, and a lack of capacity and personnel. Further, it was identified that multilateral treaties and international rule of law are critical to the social and economic advancement of small States and the role played by the, in the development of multilateral treaties was vital.

Given the universal character of space activities, limited agreements among the major space powers regarding outer space probably cannot offer a viable solution to problems calling for essentially global management;<sup>199</sup> Multilateral law making is often seen as the legitimate way to formulate and establish laws.

#### **4.4.2 Mini-Lateralism<sup>200</sup>**

The need for improvements in existing law making process is intensifying with the lack of meaningful progress in space law negotiations and legislation, for which the realities of international relations must be taken into account. “*The future of the space legislative process depends primarily on the ability of the international*

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<sup>197</sup> Id.

<sup>198</sup> [http://www.unrol.org/article.aspx?article\\_id=227](http://www.unrol.org/article.aspx?article_id=227)

<sup>199</sup> Gennady M. Danilenko, *Outer Space and the Multilateral Treaty-Making Process*, 4 Berkeley Tech. L.J. 217 (1989), pp.217-248.

<sup>200</sup> Moises Naim, *Minilateralism: The Magic Number To Get Real International Action*, Foreign Policy, June 2009 at <http://foreignpolicy.com/2009/06/21/minilateralism/>



*community to achieve a genuine consensus reflecting both the legitimate common interests of all states in space and the special interests and responsibilities of the space powers in the exploration and use of outer space for the benefit of mankind as a whole.*"<sup>201</sup>

Minilateralism is a sub-set of multilateral diplomacy, that is performed by a group of countries or other entities in international politics, dealing with specific topics or issues. According to Stewart Patrick<sup>202</sup> a proponent of the limited agreement or 'minilateralism' approach, 'in order to promote significant global policies, the smallest number of states or countries needed to create the greatest impact on a specific subject should be brought to the table'. For example, the G20, a forum of 20 countries representing 85% of global GDP, which can be handled more effectively and more practically than, say, the World Trade Organization of nearly 200 member. The magic number will break the world's untenable gridlock, and agreements reached by the small number of countries whose actions are needed to generate real solutions can provide the foundation on which more-inclusive deals can be subsequently built.<sup>203</sup> This form of law making is based on the premise that the exclusion of established power can never fully address international challenges. The failure of the Moon Agreement is an example of this established power theory.

However, this approach is subject to severe criticism.<sup>204</sup> Minilateralism is deemed to be disguised unilateralism. It leads to the creation of influential coalitions that may abuse the rights vested in them. While it is an effective solution to resolve logjams in space law making, the question still remains if this approach is legitimate. Further, the trend of States in resorting to limited agreements reflecting their position on controversial issues, apart from expressing divergent attitudes, may lead to the fragmentation of the existing space law regime. Despite this, the defects of mini-lateralism can be overcome by adopting a balanced approach. Very few States have the intention coupled with a capability to engage in commercial space mining. While so, the opinion of States that are far from this activity should not act as a hindrance to innovation, technical and economic advancements of a developed

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<sup>201</sup>Supra, note 201.

<sup>202</sup> *The Unruled World The Case for Good Enough Global Governance*, Foreign Affairs, January/February 2014 at <https://www.foreignaffairs.com/articles/2013-12-06/unruled-world>

<sup>203</sup>Supra, note 202.

<sup>204</sup> Chris Borgen, *Debating Minilateralism*, June 2009 at <http://opiniojuris.org/2009/06/28/debating-minilateralism>.

space-faring nation. At the same time, a unilateral decision of a few states must not disregard the right of the smaller States to future access and opportunity. Working the numbers, by maintaining a balance of interests would help in achieving a successful mini-lateral treaty.

To conclude, the inadequacies of the existing space law present a compelling need for its progressive evolution in order to establish a universal and efficient regime for the regulation of commercial space mining. The international regime is the end, the means to achieve this end are multiple. The international community must use its discretion in assessing how the law should be made and the nature of the law. All States have witnessed or been a part of the rich experiences in law making in the evolution of international law, particularly laws that govern res communis. Therefore, it is believed that the lessons learnt from the past will play a pivotal role in the choice of means to achieve this end.

## CONCLUSION

The first steps towards bringing the resources of the outer space within the reach of humankind have already begun. The questions regarding commercial space mining that have been pondered over for years now are gaining much more attention and urgency than they used to earlier. Technology to exploit outer space resources is growing exponentially. Yet, it is not fully prepared or equipped to satisfy commercial viability of space exploitation. The potential of outer space exploration, let alone, exploitation is yet to be fully understood. As exploration for mineral resources matures, so will the technological readiness. Such readiness must be accompanied by a business case that will provide a return on the investments made in the commercial extraction of minerals in space. Replication of mining methods on earth to the field of space to ensure the cost-effectiveness of the activity must receive more consideration than is due. In all, it will be a few more years before the activity reaches the first stages of its fullest potential.

The significance of outer space to humankind, has lead the international community to adopt a protective and sometimes defensive approach to the regulation of activities therein. This is reflected in provisions of the international space law regime. However, it is a dynamic law, which has accommodated space activities till date. Even as regards to space mining, contrary to some criticisms, the law is not obsolete. The Moon Agreement, despite its low ratification is a reflection of the intention of its drafters to encourage commercial exploitation of outer space. The OST can also accommodate commercial space exploitation. The issue with the existing law is two-fold; One, commercial activities have to adhere to the principles embodied in the laws, which seems to discourage private investment in the business and second, the law is not precise. The debate surrounding the legality of space mining will settle when solutions are found and clarifications are made to the existing grey areas in space. However it would not be practicable to disregard the entire jurisprudence in this regard which has the backing of the majority of the international community and is under the auspices of the United Nations. Therefore an astute way out would be the creation of a workable format under the current species of legislation, which is in tune with the current developments and is

adequate to hold ground for the considerable future as well.<sup>205</sup> In developing a new legal and regulatory framework for commercial mining, the probability of success will depend much on balancing the interests of private entrepreneurs and the interests of the international community. There is a marked difference in the status of space-faring nations back in the 1960s and now. The OST and the Moon Agreement maybe revisited by all State Parties, in an effort to review the law to suit changing needs. Any unilateral efforts will be met with stiff opposition. However, considering that space mining capabilities are vested with very few of these States, negotiations for a new regulatory framework will prove futile if one has to wait for universal consensus. National space legislation will play an important role in providing certainty, security, and legitimacy to the effort of private entrepreneurs. The U.S. efforts in this direction will set the example, for other nations as and when a need arises. Nonetheless, national efforts must be wholly in accordance with the international space law regime and intent of the international community. In doing so, States must not overlook the rights of access an equal opportunity of the developing-space nations.

Mini-treaties that will develop further upon the existing law or a whole new legal regime to govern space mining are one of the several options that are available. Despite the criticism it might face, such an effort can pave the way for a more mature regime in the future. Again, a balanced approach should be taken at the negotiation level, taking into consideration the varied interests of entrepreneurs, developed space faring nations and developing space faring nations. This is necessary to ensure that the new framework does not meet the fate of the Moon Agreement. Moreover, the mistakes of the past, in the regulation of activities in the deep seabed, Antarctica and the GSO should be used as guiding case studies.

The collective aspirations of the international community to exploit space resources for whatever reasons cannot be dissuaded, but checks and balances need to be placed to avoid harmful or unfavourable situations in outer space. If proper laws and permits are allowed with reasonable economic and technical rewards, the commercialization and development of outer space will undoubtedly expand in the future. It is anticipated that international law will also adapt and expand to meet the

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<sup>205</sup> Jijo George Cherian, Job Abraham, *Concept of Private Property in Space - An Analysis*, Journal of International Commercial Law and Technology Vol. 2, Issue 4 (2007) pp.211-220

challenges presented by the space frontier.<sup>206</sup> “*The Earth is the cradle of mankind, but one cannot stay in the cradle forever*”, said Konstantin Tsiolkovsky. It is true that the second phase of human exploration and use of space has now begun. As space mining matures, it will foster other ancillary space activities and also complement already existing or future activities such as deep space manned missions, human settlements, advanced robotic exploration, space depot holding etc,. The work of space lawyers and academia will also reach a momentous stage, as questions will be raised and issues to be resolved are presented. Even though commercial space mining will take a few years to transcend from paper to actual extraction and sale, the time is ripe to resolve legal issues and clarify the grey areas of international space law.

Just as how the OST was a historic development that fostered human innovation and technology to reach unimaginable success in outer space, the efforts that may soon culminate in a new legal and regulatory framework for commercial space mining will dramatically change the way man has utilized the outer space. From ‘space-based, earth-directed’ activities, additionally we are stepping into a time where there will be more ‘space- based, space-directed’ activities.

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<sup>206</sup> J.J. Hurtak, *Existing Space Law Concepts and Legislation Proposals*, 2005.

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