An International Legal Framework to Govern Space Natural Resources Exploitation

by

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ABSTRACT

Since the 1960s, there has been a very rapid development of space activities. Over the last 50 years, meteorology, telecommunication and Earth Observation satellites have become a necessity for our activities on Earth. At the same time, scientific exploration of the universe has produced extraordinary discoveries related to our solar system and also improved our knowledge of our home planet Earth. From the very first space exploration programmes and Apollo missions, the potential existence of space natural resources has generated an important scientific curiosity. The Sea, the Antarctic and the Arctic natural resources have generated a great commercial interest and continue to do so. The regimes regarding their natural resources differ as it will be analysed. Today, space natural resources are seriously considered for *in-situ* utilization in the context of both manned and unmanned future exploration missions. Beyond utilization, the question of their commercial exploitation is raised: several companies have released plans to study and exploit space natural resources: Planetary Resources Company, Golden Spike Company, Deep Space Industries and B612 Foundation to name a few. International space law was elaborated during the Cold War in order to define a framework for activities before they occur; commercial space activities are governed by a strong legal regime including notably Earth Observation, Telecommunication, Meteorology…. However, space natural resources have not been subject of a dedicated regime yet. The lack of a minimum rule agreed by all is a risk for the actors involved in this activity and the international relations. This dissertation explores the main legal issues related to the exploitation of space natural resources. Its objective is to analyze the fundamental principles of international space law that may apply and what would be the most appropriate framework. An analysis of the formation of international legal theory is conducted together with its impact on the topic of the thesis. Analogies are drawn from other international areas such as the deep seabed and Antarctica for purposes of proposing an international legal framework to govern the exploitation of space natural resources. The dissertation constitutes an original contribution to the development of law in the way it analyzes the issues related to the exploitation of space natural resources, the political dimension of the topic, and the use of a comparative analysis to define the necessary conditions for a solid legal regime.

RÉSUMÉ

Le développement des activités spatiales a été fulgurant depuis les années 60. En un demi-siècle, les satellites de météorologie, de télécommunication et d'observation de la Terre sont devenus indispensables à l'activité humaine sur Terre. En parallèle, l'exploration scientifique de l'Univers a permis des découvertes extraordinaires sur notre système solaire tout en permettant d'améliorer nos connaissances concernant la Terre. Dès les premiers programmes d'exploration spatiale avec les missions Apollo, l'existence de ressources naturelles potentielles dans l'espace a généré une grande curiosité scientifique. Aujourd'hui, l'utilisation des ressources est sérieusement considérée pour un usage local dans le cadre de futures missions d'exploration robotiques et habitées. Au-delà de l'utilisation des ressources, la question de leur exploitation commerciale se pose: plusieurs sociétés ont fait part de leur intention d'étudier et d'exploiter les ressources naturelles dans l'espace: Planetary Resources Company, Golden Spike Company, Deep Space Industries et B612 Foundation pour en mentionner que quelques unes.

Alors que le droit de l'espace a été élaboré en pleine Guerre Froide de manière à régler les questions juridiques avant qu'elles surviennent, l'exploitation commerciale de l'espace fait l'objet d'un régime solide, celle de ses ressources naturelles ne fait cependant pas l'objet d'un cadre juridique dédié. L'absence de règles minimales agréées par tous constitue un risque pour les acteurs concernés par cette activité et les relations internationales. Cette thèse explore les principales problématiques juridiques liées à l'exploitation des ressources naturelles dans l'espace. Son objectif est d'analyser les principes fondamentaux en droit de l'espace qui seraient susceptibles de s'appliquer ainsi que le cadre juridique le plus approprié. Elle fait ensuite une analyse de la théorie juridique et de son impact sur le sujet. L'analogie du droit international de l'espace existant avec les autres domaines internationaux que sont l'Antarctique et la mer permet enfin d'établir s'ils peuvent servir de base pour l'exploitation des ressources dans l'espace. Cette thèse constitue une contribution originale au développement juridique dans la manière d'aborder la problématique liée à l'exploitation des ressources dans un espace international, la dimension politique du sujet, puis l'approche par analogie indispensable pour définir les conditions nécessaires à un régime juridique solide. Son objectif est de convaincre que le politique doit s'emparer de cette problématique.

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LIST OF ACRONYMS

CD	Conference on Disarmament
CRS	Congressional Research Services
CSA	Canadian Space Agency
ESA	European Space Agency
ESAS	Exploration Systems Architecture Study
GSLV	Geosynchronous Satellite Launch Vehicle
He3	Helium 3
IISL	International Institute of Space Law
ISS	International Space Station
ISRU	In-Situ Resources Utilization
ITU	International Telecommunication Union
JAXA	Japanese Aerospace Exploration Agency
LEO	Low Earth Orbit
LRO	Lunar Reconnaissance Orbiter
LCROSS	Lunar Crater Observation and Sensing Satellite
MSR	Mars Sample Return
NASA	National Aeronautics and Space Administration
SLS	Space Launch System
UNCLOS	United Nations Convention on the Law of the Sea
UNCOPUOS	United Nations Committee on the Peaceful Use of Outer Space
USSR	Union of the Soviet Socialist Republics
US	United States of America

CHAPTER I - GENERAL INTRODUCTION

Every revolutionary idea evokes three stages of reaction: It's impossible. It's possible, but not worth doing. I said it was a good idea all along.

Arthur C. Clarke

I. THE EXPLOITATION OF SPACE NATURAL RESOURCES AND THE INTERNATIONAL LEGAL FRAMEWORK

Since the commencement of the space age in the 1950's, two primary types of space activity have been, and continue to be, conducted by mankind in space. The first type of activity is related to space applications involving the use of artificial satellites for telecommunications, earth observation and meteorology (space/Earth activities). Depending on the needs of the mission, such activities are carried out in different orbits in space. The second type of activity is related to robotic and human exploration space activities aimed at: improving our understanding of the Universe, including our own planet Earth; making scientific discoveries; and, conducting human spaceflight programmes (space/space activities).[1] Today, the quest for knowledge about space natural resources continues to be a guiding objective for scientific missions to space.[2] This thesis examines the international legal regime that governs the exploration and exploitation of space natural resources.

As a preliminary step, it is necessary to circumscribe the scope of the thesis by defining and limiting certain basic concepts. For the purposes of the thesis, space exploration is defined as encompassing all the activities conducted to physically explore outer space by robotic means and human space flight. In outer space, space resources include both tangible resources which can be found on a planet as well as intangible

[1] See *infra* in Chapter II. The results of astronomical observation and worldwide scientific missions have led to a tremendous increase of knowledge in this area which is shared by the international scientific community. As an example, 382 kilograms (842 pounds) of Moon rock samples were brought back from the Apollo missions. Those samples have been widely shared for scientific and educational purposes. Still today, it is possible to request samples under certain specified conditions. NASA analyzes each request, on the basis of a strong review process delegated to the Curation Analysis and Planning Team for Extraterrestrial Materials (CAPTEM) and the Lunar Sample Curator. All the conditions are indicated in a book titled "NASA Lunar Sample Allocation Handbook" available online: NASA <http://curator.jsc.nasa.gov/lunar/sampreq/LunarAllocHandbook.pdf> (date accessed: March 13, 2012).

[2] See *infra* for a more detailed elaboration of this trend is presented in Chapter I.

resources (such as orbits) which can be found in the vacuum-like environment of outer space. Space natural resources are defined as material natural resources which may be found in space, whether in solid, liquid or gaseous form (e.g., oxygen, water, methane and helium 3). In this study, space natural resources do not include orbits or solar rays. The term is limited to mineral and other material resources that may be found on the Moon or other celestial bodies. The thesis therefore focuses on tangible space resources which can be used as found or transformed for a specific activity or purpose. Utilization of space natural resources may be carried out either *in-situ* in space or the resources may be extracted and brought back to Earth. Utilization of space natural resources may also be carried out for scientific or commercial exploitation purposes.

In connection with space application-type activities involving the use of artificial satellites, orbits and the radio frequency spectrum are considered a finite and scarce resource. Since national appropriation of outer space by any means is forbidden, a specific regime has been established by the International Telecommunication Union (ITU)[3] to ensure the equitable distribution of orbital slots and associated radio frequencies used for the conduct of such activities among all countries. The international space law regimes that govern space activities such as Earth Observation, Telecommunication and Meteorology are generally considered to be satisfactory and to have contributed to the development of space applications in the 20th Century. With respect to robotic and human exploration activities, however, the primary issue is not one of securing orbital slots and radio frequencies for orbiting artificial satellites although the principle of freedom of exploration and use is also applicable.

While Moon rock samples were brought back to Earth during the Apollo missions, mankind's space activities have not yet reached the stage where space natural resources are being exploited. However, as demonstrated in this study, the exploitation of space natural resources is imminent. "Exploitation" means the regular extraction and refinement

[3] ITU is mandated by its Constitution to allocate radio frequency spectrum and register frequency assignments, orbital positions and other parameters of satellites "in order to avoid harmful interference between radio stations of different countries". The international spectrum management system is therefore based on regulatory procedures for frequency notification, coordination and registration. See online: ITU website online: <http://www.itu.int/net/about/itu-r.aspx> (date accessed: March 13, 2012).

of natural resources for commercial purposes.[4] It does not include extraction and utilization of space natural resources for research and scientific investigative purposes. Governance of such activities requires a clear legal framework. However, so far, international space law has not addressed (at all or in a satisfactory manner) the specific issue of space natural resource exploitation.

During the early stages of the Space Age, all space activities were dominated by two countries: the Union of the Soviet Socialist Republics (USSR) and the United States of America (US). Governments (as opposed to the private sector) were the exclusive actors in the game, and most of their national space programmes were driven mainly by national interests, technological breakthrough and defence-related considerations. This period coincides with the time frame when the current regime of international space law was elaborated under the auspices of the United Nations Committee on Peaceful Uses of Outer Space (COPUOS). Considering the political context, quick decisions were taken and key legal principles that still govern today's space activities were adopted by consensus in five international treaties considered as the "space pillars of international space law"[5] within the span of a few years. The 1967 Outer Space Treaty – the *magna carta* of space law – addresses certain fundamental legal aspects of space *exploration* but does not specifically address the *exploitation* of the resources. The treaty was negotiated and adopted during the early stages of the development of space activities.

The notion of exploitation of space natural resources was foreseen during the negotiation and adoption of the 1979 Moon Agreement. As such, the Moon Agreement explicitly provides for the establishment of an international legal regime to govern the exploitation of the natural resources of the Moon and other celestial bodies "*as such*

[4] Ram Jakhu, *Twenty Years of the Moon Agreement: Space Law Challenges for Returning to the Moon* (2005) ZLW 244 [Jakhu].

[5] These are the: *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, 610 UNTS 205, 18 UST 2410, TIAS No. 6347 [*Outer Space Treaty*]; *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, 22 April 1968, 672 UNTS 119, 19 UST 7570, TIAS 6599 [*Rescue and Return Agreement*]; *Convention on International Liability for Damage Caused by Space Objects*, 29 March 1972, 961 UNTS 187, 24 UST 2389, TIAS 7762 [*Liability Convention*]; *Convention on the Registration of Objects Launched into Outer Space*, 12 November 1974, 1023UNTS 15, 28 UST 695, TIAS 8480 [*Registration Convention*]; and *Agreement Governing the Activities of states on the Moon and other Celestial Bodies*, 18 December 1979 1363 UNTS 3, 18 ILM 1434 [*Moon Agreement*].

exploitation is about to become feasible."[6] In so doing, the Moon Agreement postponed to a later (and indeterminate) date the actual establishment and implementation of the international legal regime that will govern the exploitation of the natural resources of the Moon and other celestial bodies. Since the entry into force of the Moon Agreement in July 1984, the topic has never been officially reopened for discussion at the international level, and discussion of the subject among lawyers has become almost entirely academic.

II. RELEVANCE OF THE TOPIC

Space exploration programmes share some common characteristics with other areas of space use (e.g., defence autonomous capabilities) that are important for national prestige, national pride and national security. Space exploration contributes to the improvement of scientific knowledge and is a source of inspiration for people.

In similar fashion to the manner in which global interest in the resources of the sea bed and of Antarctica emerged in the 20th Century, space missions have started to demonstrate the value and utility of minerals that can be found in the different planets as well as in vacuum-like outer space. Recent exploratory missions have helped to establish the existence of water on the Moon and on Mars - discoveries that were broadly relayed in the international press.[7] Currently, ongoing and planned space missions are designed to achieve objectives that would provide the stepping stones for the future exploration of the Universe – an era in which the role of space natural resources will be indispensable. National space agencies around the world are conducting space programs to enable them learn about these resources and to potentially prepare for their exploitation.

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[6] *Moon Agreement*, *ibid*, art 11(5) [emphasis added].

[7] See e.g. Jean Etienne, « Phoenix a trouvé de l'eau sur Mars! » *Futura-Sciences Magazine* (date accessed : August 1, 2008) online: Futura-Sciences <http://www.futura-sciences.com/fr/news/t/astronautique/d/phoenix-a-trouve-de-leau-sur-mars_16317/>; Jean-Loup Fiévet, « La Nasa confirme la présence d'eau sur Mars » *L'Express* (date accessed : July 31, 2008) online: L'Express <http://www.lexpress.fr/actualite/sciences/decouverte/la-nasa-confirme-la-presence-d-eau-sur-mars_543774.html>; Andrea Thompson," It's Official: Water Found on the Moon" *Space.com* (date accessed : September 3, 2009) online: Space.com <http://www.space.com/scienceastronomy/090923-moon-water-discovery.html>; "NASA finds 'significant' water on moon" CNN (date accessed : November 13, 2009) online: CNN <http://www.cnn.com/2009/TECH/space/11/13/water.moon.nasa/index.html>; Daniel Nasaw, "Nasa strikes water after moon crash" *The Guardian [UK]* (date accessed : November 14, 2009) online: The Guardian [UK] <http://www.guardian.co.uk/science/2009/nov/14/moon-nasa-water-discovery>; and, « D'"importantes" quantités d'eau découvertes sur la Lune » *Le Monde [France]* (date accessed : November 13, 2009) online: Le Monde <http://www.lemonde.fr/planete/article/2009/11/13/d-importantes-quantites-d-eau-decouvertes-sur-la-lune_1266950_3244.html> (date accessed: March 13, 2012).

The use of space natural resources will be important (perhaps indispensable) in our effort to increase human understanding of our own planet Earth. *In-situ* resources utilization (hereafter ISRU) will be needed in order to support the maintenance and operation of future space bases. Today's exorbitant cost of access to space is a major factor that is driving the concept of ISRU in space. Encouraged by a new political context linked to globalization and the end of the era of bipolarization, an increasing number of countries are becoming involved in those activities that were previously carried out exclusively by the US and the USSR (now Russian Federation). India and China in particular are assuming increasingly important roles in space as in many other areas. As such, the exploitation and utilization of space natural resources is no longer a matter to be left to the exclusive domain of competition and decision-making between the US and the erstwhile USSR (now Russian Federation).

The subject is also relevant due to a new paradigm in the conduct of space activities. While in the past, space activities traditionally formed the exclusive domain of governmental entities, the last few years have seen the emergence of the private sector of "space entrepreneurs", characterized by private investors.[8] The most significant example is the successful business initiated in 2002 by Elon Musk, co-founder of the US PayPal company.[9] Musk first invested his own money in developing a new launch vehicle, and this became the first launcher developed by the private sector without any government involvement. Based on his success, Musk was awarded several public sector contracts by the National Aeronautics and Space Administration of the US (NASA). Despite the views expressed by some authors to the contrary[10], it is believed that the emergence of the private sector as a strong and active actor in space will not revolutionize the exploitation of space natural resources in the short to medium term. However, this does not mean that the private sector should be ignored. Up until now, the involvement of the private sector in space activities has been restricted to the realm of space transportation.

In recent years, the number of private companies interested in private led space exploration and exploitation of the resources has flourished. In April 2012, Planetary

[8] See *infra* Chapter II for a detailed discussion on new trends related to space exploration.
[9] For an overview of the SpaceX company, see online: SpaceX <http://www.spacex.com/company.php> (date accessed: March 13, 2012).
[10] See *infra* Chapter II.

Resources Company released its plan to develop a business directly linked to space natural resources exploitation. "Planetary Resources is bringing the natural resources of space within humanity's economic sphere of influence, propelling our future into the 21st century and beyond. Water from asteroids will fuel the in-space economy, and rare metals will increase Earth's GDP." [11] The team is composed of top experts such as Space X founder Peter Diamandis, the entrepreneurs Eric Anderson, top engineers from NASA, astronaut and scientists.

Few months later, on 6 December 2012, Golden Spike Company released its vision[12] dedicated to a commercial lunar business: "The Golden Spike Company has been formed to monetize the exploration of the Moon through sales of expeditions and their surrounding media and merchandizing revenues." Here again, the team is composed of great experts. To name a few: Mr. Gerry Griffin, Apollo Flight Director, former Director of NASA Johnson Space Center, and former head of the Greater Houston Chamber of Commerce; Dr. Alan Stern, former head of all NASA science missions and Mr. Jeff Ashby - former NASA space Shuttle commander.[13]

In January 2013[14], the Deep Space Industries released its objective. "Deep Space industries believe the human race is ready to begin harvesting the resources of space both for their use in space and to increase the wealth and prosperity of the people on planet Earth."This company is interested in asteroid mining, exploitation of orbits close to Earth, citing water, iron, gold, platinum as well as using the sun resources. They plan to send by 2014 prospective spacecrafts. The team is composed of the best experts in asteroids such as John Lewis.

Another initiative, B612 Foundation, is dedicated to asteroids hunting. This is a non profit organization dedicated to space exploration and the protection of humanity

[11] Planetary Resources company vision, see online: <http://www.planetaryresources.com/mission/> (date accessed 30 March 2013).
[12] See the company vision on the website: <http://goldenspikecompany.com/about-us/golden-spike-history/>.
[13] Golden Spike team, see: <http://goldenspikecompany.com/about-us/golden-spike-team/>. (date accessed: March 30, 2013).
[14] See CNN online: <http://edition.cnn.com/2013/01/22/us/space-asteroid-mining>; Space Com online: <http://www.space.com/19368-asteroid-mining-deep-space-industries.html> (date accessed: March 30, 2013).

against asteroid impact. [15] Ball Aerospace and B612 Foundation signed a contract in October 2012 for the Sentinel mission.[16] The B612 Sentinel mission will produce a mapping of the inner solar system thanks to a new telescope.

These initiatives need to be taken very seriously as the team behind the project are high professionals and experts in their field and strong investors believing in those projects.[17] Considering the difficult access to the area in which the exploitation is to take place, the companies dealing with these business are "fantastically capital intensive.[18]

A solid international legal framework governing space natural resources is a political necessity. The evolution of the democracies also occurred in the same manner. Ideology is guided by liberalism and "laissez-faire" doctrine. The private sector does not appreciate too much governmental involvement. Based on this approach, the tendency would be to leave the exploitation of "new areas" such outer space or the Arctic to the first comers and be reluctant to prescribe any rules to govern resource exploitation in such new areas. As will be seen below, the absence of clear governance in the exploitation of space natural resources will produce counter effects including but not limited to: the possibility of conflicting interests among private companies; a multiplication of claims over the resources; the non-existence of any legal assurance of guarantee for investors that they may be able to realize their investments in space or at least seek redress via a strong legal framework; the existence of potential international conflicts; and, risks related to pollution and affecting the sustainable development of outer space. Finally, it will prevent the scientists from doing their work thereby disabling them from responding to issues relevant to the global public interest and future generations' access to space natural resources.

With the benefit of hindsight, it is clear that international cooperation will be essential in the governance of space natural resource exploitation. Certainly the biggest success of the International Space Station (ISS) project is the high level of international

[15] See the foundation website, <http://www.b612foundation.org> (date accessed: March 30, 2013).
[16] See on B612 Foundation website the press release: < http://b612foundation.org/newsroom/press-releases/ball-aerospaceb612-foundation-sign-contract-for-sentinel-mission/>. (date accessed: March 30, 2013).
[17] See the company website, <http://www.deepspace industries.com> (date accessed: March 30, 2013).
[18] Scott J. Shackelford, "The Tragedy of the Common Heritage of Mankind", Stanford Environmental Law Journal, Vol. 27/2008, pp. 101 – 120, online, <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1407332.>. (date accessed: March 30, 2013).

cooperation it has generated among the participating states. Ronald Reagan, then President of the United States, invited international partners to join the ISS project in 1984. An invitation was extended to the Russian Federation in 1993. The final Intergovernmental Agreement of 1998 incorporates a different political balance as compared to the first draft prepared in 1988 during the Cold War era. Today, after the retirement of the US space shuttle in the summer of 2011, the US – the world's most active space faring nation – has voluntarily created dependence by stopping its access by humans to space – exploration – capacity. The United States now relies on the Russian Soyuz launcher in order for humans to reach the ISS.

The importance of international cooperation may be illustrated with another example. At the 2008 session of the Conference on Disarmament (CD) held in Geneva, China and Russia first introduced for consideration a "draft Treaty on the Prevention of the Placement of Weapons in Outer Space and the Threat or Use of Force against Outer Space Objects". The main objective of the draft treaty was to establish an explicit internationally binding ban on the placement and use of weapons in space. The US rejected the text of the proposed draft treaty and, since then, it has been impossible to attain a common understanding or some consensus on the matter. With global leadership in space but strong reliance and vulnerability due to its dependence (for both economic and defense purposes) upon space assets, the present position of the US would be very different if such treaty was ever adopted.

Finally, an analogy to the Arctic example is helpful in illustrating the political relevance of the core problem addressed in this thesis - an international legal regime to govern the exploitation of space natural resources. It is likely that before the exploitation of space natural resources, the Earth's Arctic region will be the next "Eldorado". As highlighted by the press in 2007, if the exploitation of the resources of the Arctic is a subject of great interest today, it is not too difficult to foresee that outer space resources will assume similar if not greater interest in the near future.[19] One year after the Gulf of

[19] Dominique Kopp, « Début de guerre froide sur la banquise, convoitises sur les ressources stratégiques de l'Arctique » *Le Monde Diplomatique* (1 Septembre 2007) [Kopp]. "Si l'exploitation des ressources de l'Arctique est d'une actualité brûlante, celle de l'espace est pour demain". « La bataille pour l'Arctique préfigure sans doute le scénario qui s'écrira pour l'espace, que ce soit au niveau scientifique, économique ou militaire. ».

Mexico environmental disaster, experts have re-energized the debate about the risks of drilling for oil in Alaska and the Arctic in general.[20]

Based on the provisions of the 1982 United Nations Convention on the Law of the Sea (UNCLOS),[21] the countries which border the Arctic Ocean have sovereign rights reaching out to 200 miles. Sovereign rights for potential seabed resources may only be exercised beyond the 200-mile limit if the limits of the continental shelf are proven to go beyond the 200-mile limit. In 2011, Russia presented a request to the UN regarding the delimitation of its continental shelf in the Arctic. The claim encompassed an area corresponding to about 10 billion tons of hydrocarbons - the equivalent of Persian Gulf reserves.[22] The US is also very much interested in making a similar claim. However, since it is neither a signatory nor a party to the UNCLOS, it is not legally entitled to make such a claim in international law. The situation in the Arctic is critical and directly linked to an immediate and strong interest in its natural resources.

With regard to space natural resources, we are not yet facing such international tensions but there is an urgent need for legal clarification considering the economic and political impact of the current debate. The Moon Agreement calls for the establishment of an international regime as soon as exploitation is to become feasible. The feasibility stage has now been reached.

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[20] The battle between Russia and Canada is linked to the existence of the Lomonosov ridge, considered by both countries as an extension of their territory. The present study would not be complete if the Arctic was not addressed: although it is not the subject of a dedicated agreement, it is of particular interest. The Arctic is also a subject of interest to developed countries considering the large amounts of natural resources it contains (gas, diamonds, gold) and the fact that the area is under modification - the ice is melting due to the global warming - offering opportunities for exploitation. In 2009, the US Geological Survey (USGS) issued an assessment study regarding the potential resources in the Arctic (the Circum-Arctic Resources Appraisal, CARA). The study concluded that about 13% of the world's undiscovered oil and 30% of the world's undiscovered gas may be found there, and that the Arctic region contains 22.8 billion barrels of oil with 95% probability. Over the last few years, this area has been a subject of great interest. The topic was part of the agenda of a Summit led hosted by Canada's Department of Foreign Affairs and International Trade on 29 March 2010 immediately prior to the G8 Summit to prevent conflicts in this zone.
Since there is no dedicated international agreement on this area, the North Pole located in international waters is governed by the Law of the Sea. There are five countries having territories and interests in the Arctic: Canada, Denmark, United States, Norway and Russia. See Dina Cappiello, "Gulf disaster renews debate over Arctic oil spill" *Physorg.com* (23 April 2011) online: Physorg.com <http://www.physorg.com/news/2011-04-gulf-disaster-renews-debate-arctic.html> (date accessed: March 13, 2012).

[21] *United Nations Convention on the Law of the Sea*, 10 December 1982, 1833 UNTS 397 [*UNCLOS*].

[22] See Kopp, *supra* note 19.

III. WHAT ARE MAIN ISSUES TO BE TACKLED?

The main issue arising in the context of the exploitation of space natural resources directly flows from the question of natural resources exploitation in an "international area". This is not a new topic in international law: in the past, similar contentious resource exploitation issues were internationally addressed in connection with the resources of the sea and of Antarctica. Since the absence of national sovereignty in an international area has not prevented the conduct of economic or resource exploitation activities in the sea and in Antarctica, the fundamental question that is raised and examined in this study is not entirely new. The difficulty resides in the fact that experience shows that, on both areas already regulated (i.e., the sea and Antarctica), international consensus was extremely difficult to reach.

The objective of this study is to determine whether the current regime answers to the future challenges. There are two fundamental treaties: the Outer Space Treaty and the Moon Agreement. The Outer Space Treaty contains all the fundamental principles applicable to the exploration and use of outer space. However, it does not specifically address the issue of exploitation of space resources. On the other hand, the Moon Agreement, which envisages and calls for the establishment of a specific international legal regime to govern space natural resources exploitation, has not been ratified by the main space faring nations.

In order to address the key issues, this thesis examines following questions:

1. Is the applicable international space law sufficient to appropriately address the legal issues related to the exploitation of space natural resources?
2. What would be an appropriate instrument that would secure the implementation of a strong regime on the exploitation of space natural resources?
3. Would it be accepted by the international community, are the provisions of the Moon Agreement fully or partially sufficient to address the question of resources exploitation?
4. Taking into account the above proposals, would the interest of the private sector be protected?

As shown in this study, the current body of international space law already contains relevant provisions that touch upon the exploration and use of space natural resources. When it comes to exploitation of space natural resources, however, there are

major gaps and lacunae in the existing body of international space law. Thus, in summary, the current regime partly addresses the future challenges envisaged but further work is needed to provide a secure legal framework on the scientific and commercial exploitation of the resources.

What if nothing is done? The worst case scenario would be to ignore the problem and the most predictable outcome is that a new Eldorado will flourish in outer space in the not too distant future. In the case of the deep seabed, although the regime exists, there is no significant exploitation of the resources as yet.[23] Avoiding the need to develop a legal framework now would amount to assuming the risk of heightened international tensions as has been the case in Antarctica and the High Seas in years past. Commercial exploitation of the resources will take place with or without a legal framework. The non-existence of a legal regime increases the world's exposure to the risk of environmental degradation in outer space, and also to a legal risk for the actors conducting those exploitative activities, among them the commercial actors.

IV. WHAT ARE THE POSSIBLE SOLUTIONS?

Since the commencement of space activities, none of the fundamental provisions of the existing body of international space law has been subjected to any significant amendments by governments. It is interesting to note that some entrepreneurs who strongly believe that a new category of actors will play a leading role do not hesitate to criticize the existing international legal regime. For instance, in the United States (hereafter the US), the Space Settlement Institute[24] considers that the private sector needs to take the lead in space exploration. For this purpose, it promotes the eradication of the legal framework considered as a barrier to further developments of those activities. The objective of this Institute is to make the Moon and Mars a piece of real estate available for commercial business developments. While some of their arguments make sense, the solution offered could be considered a bit extreme in an environment where decisions are still taken by governments and could also constitute a risk for the private actors themselves.

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[23] See *infra* Chapter V.

[24] The Space Settlement Institute is a non-profit association founded to help promote the human colonization and settlement of outer space. See online: Space Settlement Institute online: <http://www.space-settlement-institute.org/> (date accessed: March 13, 2012).

Since the entry into force of the Moon Agreement, no official attempt has been made to set up the envisaged international regime. Various space law scholars have written articles but no solid concrete initiative has emerged to attempt to propose a legal framework to govern resources exploitation. The common belief was that there was no need for such a regime since no exploitation had really started. The consequence is that, since today the exploitation of space natural resources is about to become feasible, there is a strong need to prepare the future framework to secure the peaceful utilization of outer space in the future. In 2004, the Board of Directors of the International Institute of Space Law (IISL) made the following statement[25] concerning property rights in space:

> The IISL is of the opinion that a specific legal regime for the exploitation of such resources should be elaborated through the United Nations, on the basis of present international space law, for the purposes of clarity and legal certainty in the near future.

In April 2008, seven non-space faring nations submitted a joint statement[26] to the United Nations on the benefits of adherence to the Moon Agreement by States Parties to the Agreement. This initiative was advanced within the Working Group on the Status and Application of the five United Nations Treaties on Outer Space but has not led to any concrete results yet.[27] Finally, it is difficult to predict which country will next be on the Moon. Which country will have the requisite interest in establishing a legal regime to govern the exploitation of space natural resources? Will it be China, the US or nations yet not possessing the capacity to conduct space exploration programs? In order to elaborate a proposal, it is necessary to first identify and address the tools required in any international legal framework on natural resources exploitation. The legal contents of the framework may then be elaborated upon in a second step.

V. OBJECT, APPROACH AND STRUCTURE OF THE THESIS

The indispensable preliminary task is to look at the current legal framework in order to identify the substantive legal issues, gaps and make proposals. For this purpose,

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[25] International Institute of Space Law (IISL), Statement of Board of Directors (22 March 2009) online: IISL <http://www.iislweb.org/publications.html> (date accessed: March 13, 2012)

[26] *Joint statement on the benefits of adherence to the Agreement governing the Activities of States on the Moon and Other Celestial Bodies by States Parties to the Agreement*, UNCOPUOS 47th Sess, Vienna 31 March-11 April 2008, UN Doc. A/AC.105/C.2/L.272.

[27] See *infra* Introduction of Chapter III.

the study will analyse the two relevant international treaties: the Outer Space Treaty which has the support of a broad cross section of the international community and the Moon Agreement, ratified by only 13 countries so far.

Several assumptions need to be made to circumscribe the work. It is assumed that the use of space natural resources and their exploitation will indeed materialize at some point in the near future. Linked to this hypothesis, it is also assumed that governments will remain key actors in space while the private sector will also continue to expand its role in space. However, just as applies in any international area of global public interest, the future potential exploitation and use of space natural resources cannot be left entirely in the hands of the private sector. So the public sector will still play a key role. A good balance between the interests of private investors and those of the public community will need to be defined. As noted above, this thesis focuses only on tangible resources – the underlying rationale is to limit the discussion to those space natural resources that have already been identified and which can be potentially exploited.

While this thesis primarily presents the findings of a research exercise, its other objective is to propose ways forward regarding the governance of the future exploitation of space natural resources which can be concretely implemented; i.e., considered acceptable by the whole international community, taking into account the needs of the developed, developing and under-developed countries as well as those of the private sector, while ensuring the protection of the outer space environment for the benefit of mankind as a whole. The nature of the matter requires appropriate measures to be taken immediately for practical and political reasons.

In order to place the subject matter of this thesis in its proper context, it is worthwhile to first explain the relevance of the exploitation of space natural resources in the space exploration programmes of States. Knowledge about space natural resources helps us to understand the Solar System and to learn about its environment, its evolution and also to better know our own planet Earth. In order to conduct activities in space, materials and resources will be essentials. Since the cost of access to space remains very high, to transport these resources from Earth to space will have a huge impact on the mission itself (in terms of cost and technology needs). For this reason, the *in-situ* use of

space resources is of particular interest, especially for human exploration missions destined to altitudes beyond Low Earth Orbit (LEO).

Since the beginning of the 21st century, a new trend has emerged: a renewed interest in robotic and manned exploration, where the quest for natural resources is part of the objective of the mission. Today, the exploitation of space natural resources has become feasible, and some States have already devised strategies aimed at gaining a better understanding those resources. Although treaty provisions refer to the principle of the exploration and use of space as well as the need to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as (and when) such exploitation is about to become feasible,[28] the debate on the implementation of this latter principle never took place. In fact, the provisions of the Moon Agreement have never been applied.

This thesis is structured into two main parts. The objective of the first Part (comprising chapters II and III) is to demonstrate the need for a legal framework dedicated to the exploitation of space natural resources. Titled "the political dimension of space natural resources exploitation", Chapter II discusses the types of resources that are presently of interest for exploitation and further demonstrates that plans for their exploitation form part of the space policies of major space faring countries. Chapter II concludes by explaining why it is believed that the exploitation of these resources is imminent and/or about to become feasible. Chapter III titled "the applicability and relevance of existing international space law to the exploitation of space natural resources" analyzes the legal aspects of the matter by comparing and contrasting the Outer Space Treaty[29] with the Moon Agreement.[30]

Part II of the thesis (comprising chapters IV and V) deals with the search for a legal framework to govern the exploitation of space natural resources – a “step by step approach”. Chapter IV, titled “the framework and the political dimension”, addresses the formation of international law and today's dynamic in space law codification to identify the best means of approaching the matter. Chapter V, titled “the Sea and Antarctic

[28] *Moon Agreement*, *supra* note 5 art 11(5).
[29] *Outer Space Treaty*, *supra* note 5.
[30] *Moon Agreement*, *supra* note 5.

models: a comparative approach", provides a comparative analysis between the legal framework proposed for the exploitation of space national resources and that applicable to the exploitation of natural resources in other international areas such as the Antarctic and the oceans. Finally, the concluding chapter (chapter VI) draws together the major findings of the study.

PART I - THE POLITICAL NEED FOR A LEGAL FRAMEWORK DEDICATED TO THE EXPLOITATION OF SPACE NATURAL RESOURCES

The objective of this first part of the study is to show that space natural resources have (or will soon) become a prominent feature of the space exploration programs of many countries. Space natural resources of interest for exploitation are identified and the role they could play in the future is developed. This part of the thesis demonstrates that the exploitation of such resources has become imminent and/or will become feasible. Accordingly, a strong legal framework is required. An analysis of the existing legal framework is carried out for the purpose of determining whether or not the provisions thereof are relevant. Conclusions are drawn on a possible need for further codification. This part of the thesis aims at circumscribing the topic of the study by shedding light on of the different facets of the problem before a proposal is elaborated in the second part. The political dimension of the topic is first highlighted before addressing the legal issues.

CHAPTER II – THE POLITICAL DIMENSION OF SPACE NATURAL RESOURCES EXPLOITATION

I. INTRODUCTION

Why explore? Pioneering in the space frontier is part of mankind's desire to always expand his horizons - it is an integral part of human nature and destiny to explore the unknown. Space is considered as the most logical next step in human exploration. As such, the main rationale underlying human space exploration is that it provides the opportunity for mankind to conduct advanced scientific research to learn where we are, where we come from and how the Earth environment may evolve in the future. During the Cold War, human spaceflight activities were used as a political tool for enhancing national prestige. Space exploration was therefore conducted mainly for political reasons. In spite of the foregoing, space exploration missions conducted during that era helped to significantly improve scientific knowledge. Thus, the space race during the Cold War era helped to accomplish major technological breakthroughs.[1]

Today, among the potential technological projects to be conducted in space, it is envisaged that heavy reliance will be placed on utilizing energy from the sun. Thus, concepts such as solar-powered satellites,[2] based solar-panel arrays, or even solar energy airplanes,[3] for example, are being considered. The objective of most of these applications is to harness the sun's energy for use in meeting human needs on Earth. Space natural

[1] For example, in preparation for the missions Moon, technology that could photograph the Moon's surface was needed. NASA created this technology and from it scientists developed Computer-Aided Tomography (CAT) and Magnetic Resonance Imaging (MRI) technologies. Today, CAT scanners and MRIs are used in hospitals world-wide. NASA also developed a way for power tools to be used without cords. Today, cordless power tools are everywhere. For the historical aspect, see online: Space Race History <http://spaceracehistory.tripod.com/spin.shtml> (date accessed: March 13, 2012).

[2] David Shiga, "California gives green light to space solar power" *The New Scientist* online: The New Scientist < http://www.newscientist.com/article/dn18247-california-gives-green-light-to-space-solar-power.html> (date accessed: December 8, 2009) In December 2009, the California Public Utilities Commission gave its blessing to an agreement that would see the Pacific Gas and Electric Company buy 200 megawatts of power beamed down from solar-power satellites beginning in 2016. A start-up company called Solaren is designing the satellites, which it says will use radio waves to beam energy down to a receiving station on Earth. The attraction of collecting solar power in space is the virtually uninterrupted sunshine available in geosynchronous orbit. Earth-based solar cells, by contrast, can only collect sunlight during daytime and when skies are clear. However, some major challenges will have to be overcome if the technology is to be used widely.

[3] See e.g., The Solar Impulse Project online: Solar Impulse Project <http://www.solarimpulse.com/> (date accessed: March 13, 2012).

resources coming from other planets and small bodies in the solar system are raising a lot of interest among the scientific community and, as is established in this Part of the thesis, the interest in studying space resources constitutes an integral part of all space exploration missions. With the expansion of scientific knowledge, the technology for exploiting the resources has also matured as addressed below.

How to explore? There are numerous ways of conducting space exploration. It is done from Earth using observatories, or from space using space-based telescopes (e.g., Hubble space telescope). It may also be conducted by way of sending manned or unmanned spacecraft to comets and asteroids, or even to land on a planet. Human space missions are also part of space exploration. Significant progress has been made since the commencement of the Space Age: from an era of competition driven by political interest in the 1960's, increased international cooperation between the major space faring nations culminated in the International Space Station project in the 1980's. Recently, there has been a renewed interest in space exploration among the traditional space faring nations (the US, the Russian Federation and European States), and also in certain Asian countries (Japan, India and China). Considering the impressive achievements in space already made by this latter category of states, it would be misleading (in fact inappropriate) to describe them as new actors in space.

Today, there is an increasing trend of regional and international cooperation in space activities along with a multiplication of space actors. Based on this new international context, the exploitation of space natural resources is no longer confined to the traditional science and technology domains. It has become a truly political issue: the state of the world economy is such that liberalism has become the main ideology. As a consequence, topics dealing with common concerns – sharing of resources, environment protection, and pollution – easily raise difficulties as they require different States to agree on common principles having a direct impact on their sovereignty and financial interests.[4]

In the next section, an effort is made to demonstrate the relevance of space natural resources for future space exploration activities. The section that follows demonstrates that the exploitation of space natural resources has become a prominent feature of the

[4] See *infra* Chapter V.

space exploration programs of traditional and emerging space faring nations, and that such exploitation of space natural resources is on the verge of becoming feasible.

II. THE RELEVANCE OF SPACE NATURAL RESOURCES TO FUTURE SPACE EXPLORATION ACTIVITIES

Major scientific discoveries achieved by space agencies around the world have established the value and utility of space resources as highlighted in this section. To clearly understand the issues and challenges at stake, it is important to know which potential space natural resources are of interest and why? Secondly, it is necessary to assess the importance and usefulness of these resources. Considering the recent trend towards the emergence of private space entrepreneurs mainly in the US, it is useful to take into account the probable consequences that this may have on the future exploitation of space natural resources.

1. WHAT ARE THE POTENTIAL SPACE NATURAL RESOURCES?

With respect to the Moon, two potential resources are of utmost interest according to the opinions expressed by scientists: water existing in the form of ice, referred to by scientists as "water ice"; and, oxygen contained in silicates found in the regolith on the Moon. The rock samples brought back to Earth during the Apollo missions (conducted between 1969 and 1972) did not establish the existence of water on the Moon. However, since then, the results obtained from automated missions have shown the contrary. In 1994, the US Clementine mission provided substantial evidence of the existence of frozen water inside the crater at the Moon's South Pole. In 1998 and 1999, the Lunar Prospector spacecraft also provided proof of the existence of ice in the vicinity of both poles of the Moon. A year later, the Cassini mission destined for Saturn observed the same results while in close proximity to the Moon. The data analysis demonstrates a possible widespread distribution of water on the Moon, with an increasing presence at the poles. Water ice can be found in regolith pores in permanently shadowed craters near the poles. In a statement attributed to Ben Bussey, staff scientist at the Planetary Exploration Group at John Hopkins University's Applied Physics Laboratory, he is of the opinion that

"[t]here are extensive dark regions at both lunar poles, and these represent potential locations for ice deposits".[5]

In 2004, the European Smart-1 mission that was launched in 2003 confirmed the existence of ice while orbiting the Moon and conducting detailed studies of its chemical composition.[6] Further, the Deep Impact mission, launched by the US in 1995 also detected water on the Moon while going to the comet Tempel 1. This mission showed that the entire surface of the Moon was hydrated at least during a large part of the lunar day, with the water being evaporated by the Sun.[7] Using a US instrument known as the Moon Mineralogy Mapper, an Indian spacecraft, Chandrayaan-1, launched in October 2008, has demonstrated the existence of water molecules on the Moon not only at the poles but broadly on the surface. This was a major success for India's first scientific mission in space. The US Lunar Reconnaissance Orbiter (LRO),[8] launched in June 2009 with the objective of defining potential landing sites on the Moon, was able to characterize the environment of the Moon and to test new technologies. In October 2009, the US Lunar CRater Observation and Sensing Satellite (LCROSS) mission excavated and analyzed 2.3 tons of material from the permanently dark floor of one of the Moon's polar craters (Cabeus). Analysis of the excavated material has shown the existence of a significant area of frozen water on the Moon.[9]

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[5] Leonard David, "Mining the Moon, the Gateway to Mars" (10 November 2004) *Space.com* online: Space.com <http://www.space.com/businesstechnology/technology/moon_mining_041110.html> (date accessed: March 13, 2012).

[6] For more details about the Smart-1 mission, see online: European Space Agency <http://www.esa.int/export/SPECIALS/SMART-1/SEMSDE1A6BD_0.html> (date accessed: March 13, 2012).

[7] In the words of Jessica Sunshine, astronomer at the University of Maryland, "[O]ur findings suggest a solar driven cycle in which layers of water only a few molecules thick form, dissipate and reform on the surface each lunar day. We postulate that hydrogen ions from the sun are carried by the solar wind to the moon and there interact with oxygen rich minerals in lunar soil and rock to produce the water [H_2O] and hydroxyl [OH] molecules that spectral analysis clearly show us is there. This water is formed in the morning and then by lunar mid-day heat from the sun causes the molecules to evaporate. See NASA EPOXI mission online: NASA <http://epoxi.umd.edu/2science/hydratedmoon.shtml> (date accessed: March 13, 2012).

[8] NASA Goddard Space Flight Center online: NASA <http://lunar.gsfc.nasa.gov/launch.html> (date accessed: March 13, 2012).

[9] « D'"importantes" quantités d'eau découvertes sur la Lune » *Le Monde* [France] (13 November 2009) online: Le Monde <http://www.lemonde.fr/planete/article/2009/11/13/d-importantes-quantites-d-eau-decouvertes-sur-la-lune_1266950_3244.html> (date accessed: March 13, 2012).

As part of the Lunar Resources Exploitation Study, the European Space Agency (ESA) has considered over twenty processes for the production of oxygen from the lunar regolith. Vapour pyrolysis has been selected as a prime candidate process, and a conceptual pilot plant design has been created, incorporating the core process and support technologies for oxygen liquefaction, handling and storage; electrical power generation and storage; waste heat rejection; and, process feed production.[10] Cumulatively, these discoveries prove that the Moon is chemically active. Beyond water and oxygen, there are other potential resources on the Moon: titanium, platinum, silicon, ammonia and mercury. The Moon may also contain europium and tantalum – resources that are highly desired on Earth for use in the green energy business and in defense industries.

The existence of water on Mars could make future exploration missions quite feasible. There is direct evidence from past space missions that Mars once had liquid water. Scientists are now trying to find evidence of past life on Mars since, on Earth, liquid water is an essential requirement for life.[11] An exobiological hypothesis that has attained support from some scientists is that there could be life in the dark dune spots of the southern polar region of Mars. These spots have a characteristic annual morphological cycle and it is suspected that liquid water forms in those spots every year.[12]

Water is absorbed and chemically bound in the Martian and Lunar regolith, and water vapour can be found in the Martian atmosphere. Several national space agencies have already made important discoveries on Mars. NASA for instance has publicly announced that the findings of the Mars Global Surveyor mission establish the presence of water on Mars.[13] US Scientists made interesting discoveries a few months after two NASA robots landed on Mars in January 2004 - evidence found by the Rover spacecraft in a rock outcrop led scientists to interesting conclusions. Clues from the rock's

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[10] Lunar Resources Exploitation Study, Executive Summary, AEA Technology, Contractor Report, Prepared for ESA under ESTEC Contract (N° 11196/94NL/JG), online: < http://esamultimedia.esa.int/docs/gsp/completed/comp_sc_94_N50.pdf> (date accessed: March 13, 2012).
[11] Chris P McKay, "The search for life on Mars", in Ralph Pudritz, Paul Higgs & Jonathon Stone, eds, *Planetary Systems and the Origins of Life*, (Cambridge: Cambridge University Press, 2007) 238 [McKay].
[12] Eörs Szathmáary *et al*, "Life in the dark dune spots of Mars: a testable hypothesis", in Ralph Pudritz, Paul Higgs & Jonathon Stone, eds, *Planetary Systems and the Origins of Life*, (Cambridge: Cambridge University Press, 2007) 241 [Szathmáary *et al*].
[13] "NASA announces discovery of evidence of water on Mars" *Space.com* online: <http://www.space.com/scienceastronomy/solarsystem/mars_water_story_000620.html>.(date accessed: March 13, 2012).

composition, such as the presence of sulphates, and the rock's physical appearance – particularly its niches where crystals grew – helped make the case for a watery history.[14] This mission had an incredible media impact: although the robot's life expectancy was a mere three months, it lasted more than seven years and really helped to make important breakthroughs in the geological knowledge of Mars.[15] The detection of methane in the atmosphere of Mars is also interesting as it demonstrates that at some point there may have been (or there still is) life on Mars. Methane is a major constituent of natural gas and it is released during the decomposition of plant or other organic compounds as in marshes and coal mines.[16] The detection of methane on Mars, however, requires further scientific investigations to better understand what is producing the methane.[17]

Scientists and engineers are always looking for new sources of energy, nuclear energy being one of them. Energy obtained from nuclear fusion appears to be more attractive than that obtained as a result of nuclear fission. The main advantage of the fusion process as compared to fission is that the former releases a lower number of neutrons than the latter, and, as a consequence, produces less nuclear waste since neutrons are the source of high levels of radioactive waste. It has been scientifically established that, under conditions of high energy collisions, Helium-3 (He3) would fuse with other nuclei to release relatively more energy and less waste than the reactions that occur in traditional nuclear reactors. In other words, the potential energy to be harnessed from He3 would be much cleaner and safer than that provided by nuclear fuels. Some scientists are convinced that He3 can provide an important energy source on Earth in the 21st Century. It has therefore been suggested that He3 is perhaps the only resource on the Moon (or for

[14] NASA, Press release, "Opportunity Rover finds Strong Evidence Meridiani Planum was wet" (March 2, 2004) online: NASA <http://marsrovers.nasa.gov/newsroom/pressreleases/20040302a.html> (date accessed: March 13, 2012). "'Liquid water once flowed through these rocks. It changed their texture, and it changed their chemistry,' said Dr. Steve Squyres of Cornell University, Ithaca, N.Y., principal investigator for the science instruments on Opportunity and its twin, Spirit. 'We've been able to read the tell-tale clues the water left behind, giving us confidence in that conclusion'".

[15] See online: NASA <http://marsrover.nasa.gov/home/index.html> (date accessed: March 13, 2012)

[16] For a definition of methane, see online: Your Dictionary <http://science.yourdictionary.com/methane> (date accessed: March 13, 2012).

[17] "If microscopic Martian life is producing the methane, it likely resides far below the surface, where it's still warm enough for liquid water to exist. Liquid water, as well as energy sources and a supply of carbon, are necessary for all known forms of life." See online: NASA <http://www.nasa.gov/mission_pages/mars/news/marsmethane.html> (date accessed: March 13, 2012).

that matter in space) that could justify the cost of bringing it to the Earth.[18] It has also been argued that He3 may have a significant potential to support life in space and could reduce the cost of space settlement. American geologist and former astronaut Harrison Schmitt, has expressed strong support for the use of He3 as a source of energy on the Moon.[19] In 2005, China also showed strong interest in He3.[20]

The quest for energy on the Moon is seen by some authors as a "race to the moon for nuclear fuel".[21] Extensive discussions took place after the release of the US vision for space exploration in 2004, by President George W. Bush. The resources of the Moon have even been presented as a possible solution to the impending peak in oil production. It has been suggested that they could be used as a substitute to Earth-based fossil fuel.[22] However, the possibility of using He3 as a source of Energy has been criticized on the ground that it is a technically difficult task and that the technology demonstration has not been done.[23] He3 and the potential role it could play in the future remain debatable among experts.

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[18] G. Kulcinski *et al*, "The Development of Lunar He3 Resources: Near-Term Applications and Long-Term Prospects", Proceedings of the Fourth International Conference on Exploration and Utilisation of the Moon, 10-14 July 2000, (Noordwijk, the Netherlands: ESTEC-European Space Agency, 2000) 164 [Kulcinski *et al*].

[19] G. Kulcinski and Harrison Schmitt, "The moon: an abundant source of clean and safe fusion fuel for the 21st century", in NASA, Lewis Research Center, Lunar Helium-3 and Fusion Power, (Presented at the 11th International Scientif ic Forum on Fueling the 21st Century, Moscow (ISSR), 29 sept.-6 oct. 1987), NASA online: <http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19890005472_1989005472.pdf> (date accessed: March 13, 2012). [Kulcinski & Schmitt]. In 2011, Schmitt reaffirmed his position on the topic stating: "[u]nder certain financial constraints, helium-3 can be economically viable as a fuel for fusion power reactors here on Earth, and to have that dominated by another power such as China I think would be very dangerous for us. That's just another aspect of the geopolitical significance of exploration". See Harrison Schmitt, "Nix NASA Completely, Apollo Astronaut Says", (25 May 2011) online: Space.com <http://www.space.com/11789-nasa-replacing-apollo-astronaut-jfk-moon.html> (date accessed: March 13, 2012).

[20] "China plans moon landing around 2017" China News online: Xinhua News <http://news.xinhuanet.com/english/2005-11/05/content_3733767.htm> (date accessed: November 5, 2005).

[21] John Lasker, "Race to the moon for nuclear fuel" *Wired Magazine* (15 December 2006) online: Wired <http://www.wired.com/science/space/news/2006/12/72276?currentPage=all> (date accessed: March 13, 2012) [Lasker].

[22] Many articles have been written on the topic. See e.g., *ibid*.

[23] In a 20 August 2008 interview with Scientific American, Buzz Aldrin said: "Well, some people think helium 3 is a great material. I don't think we have the appropriate reactor yet to say, 'Oh! We're going to go to the moon and we are going to mine helium 3 and bring it back.' Yeah, if you can demonstrate you can really use it". See "What's the Buzz: A Conversation with Buzz Aldrin" *Scientific American Magazine* (August 20 2008) (podcast) online: <http://www.scientificamerican.com/podcast/episode.cfm?id=E06922B1-BDEB-A748-83A39C51D1F1B2B5> (date accessed: March 13, 2012).

Finally, in terms of space natural resources, Titan,[24] the second largest moon of our solar system which orbits Saturn, is a prime subject of interest for scientists. Analogies have been drawn between the Earth and Titan. A complex organic chemistry seems to be present in Titan's components: air (gas atmosphere), aerosols (solid atmosphere) and surface (lakes). For some scientists, the temperature conditions that exist in Titan's subsurface oceans could allow the development of living systems. The Cassini-Huygens mission provided a significant amount of new observational data about Titan including the existence of methane.[25] The Visible and Infrared Mapping Spectrometer (VIMS) of Cassini recently discovered liquid methane while overflying Titan's Ontario Lake in December 2007. However, in view of the distance between Titan and the Sun the average temperature is at Titan's surface is about -289 degrees Fahrenheit (-178 degrees Celsius). The effect of this cold temperature is that it liquefies small hydrocarbons like methane and ethane. Titan is the first celestial body in the solar system besides Earth known to have liquid on its surface. Scientists believe that Titan might have oceans of methane, ethane and other hydrocarbons and the fact that the surface material is liquid has been established.[26]

2. THE EXPLOITATION OF SPACE NATURAL RESOURCES IS INEVITABLE

2.1 *IN-SITU* UTILIZATION OF RESOURCES

The very first use to which space natural resources may be put is to draw analogies from their very existence in order to better understand our planet Earth as a constituent part of the solar system. On the Moon, for example, this can be achieved with the collection of high-resolution data to create a chemical and mineralogical map of the Moon's interior; to search for sub-surface water at the lunar poles, and develop a high resolution, three-dimensional topographical map of the lunar surface on both the near and far sides. By searching for elements such as Magnesium, Aluminum, Silicon, Calcium,

[24] For information about Titan, see online: NASA <http://solarsystem.nasa.gov/planets/profile.cfm?Object=Titan> (date accessed: March 13, 2012).
[25] François Raulin, "Titan: a new astrobiological vision from the Cassini-Huygens data" in R Pudritz, P Higgs and J Stone, eds, *Planetary System and the Origins of Life* (Cambridge, UK: Cambridge University Press, 2007) 263.
[26] Marc Mennessier, Découverte d'un lac extraterrestre sur Titan, Le Figaro, 1 August 2008, Le Monde online : < http://www.lefigaro.fr/sciences/2008/08/01/01008-20080801ARTFIG00019-decouverte-d-un-lac-extraterrestre-sur-titan-.php> (date accessed : August 4, 2008).

Iron, and Titanium while creating a detailed map of the lunar surface, scientists can answer questions about the Moon's origin and geological evolution and how that relates to the evolution of the Earth.

Today, the high cost of access to space remains an obstacle to the transportation of materials from Earth to space. While there is no consensus on the matter, it is generally assumed that at least one thousand US dollars are required in order to pay for the launching of an object weighing one pound in space.[27] Against this backdrop, the possibility of using space-based resources in space exploration would facilitate the conduct of space missions. *In-situ* resources utilization (ISRU) could therefore play a potentially significant role in future space exploration efforts.[28] NASA concurs in this opinion by noting that "*in*-situ resource utilization will enable the affordable establishment of extraterrestrial exploration and operations by minimizing the materials carried from Earth and by developing advanced, autonomous devices to optimize the benefits of available *in-situ* resources".[29] Further, NASA's Exploration Systems Architecture Study (ESAS) Report released in 2005 notes that "ISRU: Technologies for 'living off the land' are needed to support a long-term strategy for human exploration." [30] The *in-situ* use of resources could be of tremendous interest for any space exploration project: the goal is to collect resources and materials from space and use them in space to support human and robotic missions.

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[27] John F McGowan, "Cheap access to space: lessons from past breakthroughs" *The Space Review* (11 May 2009) online: The Space Review <http://www.thespacereview.com/article/1368/1>; Frank Sietzen Jr, "Spacelift Washington: International Space Transportation Association Faltering; The myth of $10,000 per pound" *SpaceRef Magazine* (18 March 2001) online: SpaceRef <http://www.spaceref.com/news/viewnews.html?id=301>; "Round trip or one way?" Polaris Project Evening Star website, online: <http://www.polaris.iastate.edu/EveningStar/Unit7/unit7_sub2.htm> (date accessed: March 13, 2012).

[28] See online: Lunarpedia <http://www.lunarpedia.org/index.php?title=In_Situ_Resource_Utilization> where "In Situ Resource Utilization" (ISRU) is defined as follows: the production of useful materials from the resources available at a given location. The phrase is from the Latin *in situ*, meaning "at the site", or "in place." ISRU can be categorized into production of materials useful at the current location, primarily: life support, propellant, radiation shielding, construction and structural materials, and raw materials for other production useful for habitat expansion.

[29] See online: NASA <http://www.nasa.gov/centers/ames/research/technology-onepagers/in-situ_resource_Utiliza14.html> (date accessed: March 13, 2012).

[30] NASA, *Final Report of the Exploration Systems Architecture Study* (ESAS) online: NASA <http://www.nasa.gov/mission_pages/exploration/news/ESAS_report.html> (date accessed: March 13, 2012).

NASA's Mars Sample Return (MSR) mission features prominently among major exploration projects of the future. The objective of the MSR mission is to bring soil and rock samples from Mars to Earth for study in terrestrial labs.[31] Scientists consider that the comprehension of fundamental questions about Mars, its past and its evolution is a key step to understanding other planets.[32] One of the fundamental issues arising in the context of this mission is to determine the pros and cons of returning samples to Earth as against *in-situ* analysis on Mars. Proponents of sample return argue that, on Earth, there is the possibility to make as many changes as desired to the preparation and analysis of the sample, and that the returned sample will be available for use by future generations, using ever improving technology.[33] Proponents of *in-situ* analysis on the other hand argue that it is the only way to prepare for any future human settlement in space. In support, one study[34] has concluded that the use of locally-generated oxygen on Mars (ISRU) can reduce the mass of ascent-related systems required to be landed on Mars for a fixed payload size, or can increase the payload returned from Mars for a fixed mass of ascent systems. As a baseline, the study analyzed the return of a 0.5 kg Mars sample to Low Earth Orbit. While different propellant production systems using ISRU have been proposed for use on MSR missions, the study focuses on using solid-oxide electrolysis of carbon dioxide from the Martian atmosphere. Since 95% of the Martian atmosphere consists of carbon dioxide evenly distributed over the surface of Mars, this resource could be collected, compressed and then used to produce, liquefy and store oxygen on the surface of Mars. The study concludes that ISRU is advantageous for a minimum sample mass of 0.5 kg as it results in significant savings in the mass delivered to the Martian surface that could be used for transportation of samples from the Martian surface to low Earth orbit. The study also found that savings improve as sample mass increases and

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[31] For general information on Mars Sample Return (MSR), see online: NASA <http://mars.jpl.nasa.gov/missions/future/futureMissions.html> (date accessed: March 13, 2012).
[32] Phillip M Cunio, *et al*, "Near-Term Mars Sample Return Using In-Situ Oxygen Generation" *Proceedings of the AIAA Space 2007 Conference & Exposition* Long Beach, California (18-20 September 2007) at 1 [Cunio *et al*].
[33] See online: NASA <http://mars.jpl.nasa.gov/missions/future/futureMissions.html> (date accessed: March 13, 2012).
[34] Ryan Odegard, Jim Keller, & Geoffrey A Landins, "Oxygen generation and storage for a Mars sample return mission utilizing in-situ resources" *Proceedings of the AIAA Space 2007 Conference & Exposition* Long Beach, California (18-20 September 2007) at 11 [Odegard *et al*].
[34] *Ibid*.

could prove to be mission-enabling for a manned mission. For a mission baseline of 0.5 kg of Martian soil, rocks and atmospheric samples, the advantage of using Mars-generated oxygen in an ISRU context over a non-ISRU mission is that 2 kg of sample mass can be returned in the former case as against only 1 kg for a mission that uses space-storable propellant.

However, while ISRU seems to have great potential, the cost/benefit ratio associated with it has not been proven as yet. It is also important to keep in mind that the extraction of oxygen from regolith and the removal of ice from the poles are two difficult experiments to conduct: in the former case a high temperature process (a chemical process) will be required whereas in the latter it will be difficult to detect where the largest amount of ice may be located (a physical process).[35]

2.2 SPACE NATURAL RESOURCES: THE LONG-TERM PERSPECTIVE - SCIENCE FICTION?

Space natural resources may be used for Earth needs – the use of space natural resources for energy generation could be a response to the ongoing global energy crisis. In a workshop organized by NASA as far back as 1977, the potential of using near-Earth resources to meet future needs on Earth was envisaged. Participants even considered that "a significant level of production of transferable (useful) material can occur on a time scale of 20 to 30 years, say by the year 2000"(!).[36] The purpose here is not to evaluate or make any value judgments on what may happen but rather to focus on the hypothesis that space natural resources may be of interest in the distant future. Some experts strongly believe that space natural resources are part of our future.[37]

Today, the world's population is about 7 billion. Extrapolations based on 2008 United Nations data[38] suggest that the world population could exceed 9 billion by the year

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[35] Donald Rapp, The problems with lunar ISRU, *The Space Review* (September 5 2006) online: The Space Review <http://www.thespacereview.com/article/697/1> (date accessed: March 13, 2012).
[36] James R Arnold and Michael B Duke, eds, *Summer Workshop on Near-Earth Resources* NASA Conference Publication No. 2031 (Washington DC: NASA Scientific and Technical Information Office, 1978) at iv.
[37] Peter Diamandis, "Space: The Final Frontier of Profit?" *The Wall Street Journal* (13 February 2010), online: Wall Street Journal <http://online.wsj.com/article/SB10001424052748703382904575059350409331536.html> (date accessed: March 13, 2012) [Diamandis].
[38] United Nations Population Division, Press Release, "World Population to exceed 9 billion by 2050: Developing Countries to Add 2.3 Billion Inhabitants with 1.1 Billion Aged Over 60 and 1.2 Billion of

2050. A UN report highlights the fact that developing countries could add 2.3 billion inhabitants with 1.1 billion aged over 60 and 1.2 billion of working age. The population in developing countries is still very young. The situation is even more critical in the least developed countries, raising major economic, health and resources issues. In the developing countries, an increase of the population aged 60 and over is envisaged, and the numbers are expected to rise from 475 million in 2009 to 1.6 billion by 2050. The evolution will mainly depend on the fertility rate. Although the population of some countries is expected to decrease, growth will occur in those countries that are currently most populous. "During 2010-2050, nine countries are expected to account for half of the world's projected population increase: India, Pakistan, Nigeria, Ethiopia, the United States of America, the Democratic Republic of Congo, the United Republic of Tanzania, China and Bangladesh, listed according to the size of their contribution to global population growth."[39] Another report published only a few years later highlights the fact that the global population could reach 9 billion by 2040, thereby significantly increasing the demand for global resources. The report concludes that the global development model is unsustainable;

> "By 2030, the world will need at least 50 per cent more food, 45 per cent more energy and 30 per cent more water — all at a time when environmental boundaries are throwing up new limits to supply. This is true not least for climate change, which affects all aspects of human and planetary health." [40]

Today, to believe that space resources will soon supplement Earth resources is a utopia. Presently, efforts are being made to look for resources in new areas; massive investments are being poured into research efforts on Earth focusing on remote areas, deeper zones of the Ocean, or even foreign countries with geopolitical issues. As discussed below[41], the Antarctic and the deep seabed are areas of such great interest. In the longer term, it is envisaged that the utilization of space natural resources will probably

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Working Age" (9 March 2010) online: UN <http://www.un.org/esa/population/publications/wpp2008/pressrelease.pdf> (date accessed: February 27, 2010).

[39] *Ibid*.

[40] See United Nations High-Level Panel on Global Sustainability, *Resilient people resilient planet, a future worth choosing* (30 January 2012) online: UN <http://www.un.org/gsp/sites/default/files/attachments/GSPReportOverview_A4%20size.pdf> (date accessed: March 13, 2012)

[41] See *infra* Chapter V.

occur *in-situ*. With the advent of new space missions and possible short term settlement, transformation of the resources into energy that can be utilized will be required and we will have to deal with exploitation as an imminent matter. It is already anticipated that potential use of space natural resources will be two pronged: for science and for commercial purposes.

2.3 THE TECHNOLOGY FOR THE EXPLOITATION OF SPACE NATURAL RESOURCES IS PRESENTLY MATURE

Mankind has developed technology to go to Low Earth Orbit and to explore deep space. While the cost of access to space remains high, the technology for accessing space does exist. A heavy launcher is usually needed for these types of space missions and those countries possessing space capability have all developed or are developing heavy lift launchers[42] (e.g., China's Long March 3B and 5 (under development); India's Geosynchronous Satellite Launch Vehicle (GLSV Mk III under development); Russia's Proton and Angara (under development); Space X company's Falcon 9 and Falcon Heavy (under development); Japan's H-IIB; Europe's Ariane 5; Ukraine's Zenit-2M; and the US's Atlas V, Delta IV and the Space Launch System (SLS) under development following the retirement of the space shuttle. Development of a heavy lift space launch capability, however, does not mean that all the above-mentioned countries have the capacity to go to the Moon or Mars, but the technology already exists or is under development for those missions whose destinations are beyond Low Earth Orbit.[43]

Technology that enables the placement of objects in orbit around planets already exists. For example, NASA's Deep Space 1 probe launched in 1998 pioneered the use of the ion propulsion mechanism. The second time the same technology was used was during the European Smart-1 mission. To save fuel, the European spacecraft used specific techniques such as making use of "lunar resonances" and fly-bys. [44] Landing on the Moon has already been achieved beginning with the Soviet Union's Luna missions and followed by the United States Surveyor and Apollo missions. Following these pioneering

[42] Defined here as capable of launching greater than 10 metric tons (10,000kg) to Low Earth Orbit.
[43] See presentation on heavy launchers by Alain Souchier, Mars Planet French Association President, Neuchatel, (1 October 2011) [unpublished, on file with author].
[44] On SMART-1 techniques used, see online: European Space Agency <http://www.esa.int/export/SPECIALS/SMART-1/SEMSDE1A6BD_0.html> (date accessed: March 13, 2012).

experiences, space agencies around the world have conducted various robotic exploration missions. They have developed key space exploration technologies such as in-orbit rendezvous with, for example, the European Automated Transfer Vehicle, a module carrying 6.6 tonnes of cargo which automatically docks with the Russian module Zvezda of the ISS.[45] The Cassini Huygens probe landed on Titan on 14 January 2005. It was the first time a probe landed on the surface of a Solar system planet, using the deployment of parachutes to reach the surface. [46] A lot has already been accomplished with regard to exploitation techniques. Among the current techniques that are being developed for the extraction of water from the Moon or Mars, NASA scientists are working on microwave beams for future missions:

> No magic - says Ed Ethridge of NASA's Marshall Space Flight Center – just microwaves. We're showing how microwaves can extract water from moon dust by heating it from the inside out. [47]

The objective is to develop new processes to capture water thereby eliminating the energy-intensive requirement of having to dig. Exploitation of space natural resources will require independence and self-sufficiency from the Earth. In this regard, the *in-situ* use of materials will be necessary for the construction as well as for producing the energy required to stay in space. While a lot remains to be discovered, current techniques already developed have shown that scientists are able to travel, land and start exploitation of the resources.

Over the last few years, new actors coming from the American private sector are claiming that an era of space business led by private space entrepreneurs has commenced. These new actors are advocating fundamental changes to the traditional role of

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[45] "The ATV then remains attached as a pressurised and integral part of the Station for up to six months. After that it detaches and re-enters Earth's atmosphere, during which it breaks up and burns, together with up to 6.4 tonnes of waste from the Station". For detailed information about the ATV, see online: European Space Agency <http://www.esa.int/esaMI/ATV/SEMOP432VBF_0.html> (date accessed: March 13, 2012).
[46] For detailed information about Cassini Huygens mission, see online: European Space Agency <http://sci.esa.int/science-e/www/area/index.cfm?fareaid=12> (date accessed: March 13, 2012).
[47] See especially Dauna Coulter, "Microwaving Water from Moondust" *Moon Daily* (8 October 2009). online: Moon Daily <http://www.moondaily.com/reports/Microwaving_Water_From_Moondust_999.html>. See also, Ray Garner, "Microwaves Can Extract Water from Moon, Mars" *Innovations Report* (7 October 2010) online: Innovations Report <http://www.innovations-report.com/html/reports/physics_astronomy/microwaves_extract_water_moon_mars_119682.html> (date accessed: March 13, 2012).

governments in space. They support a different approach to space exploration and they are also pushing for the establishment of a deep space outpost – missions requiring the exploitation of space natural resources. While governments will very likely remain the leaders in space for a while, one cannot ignore this new trend. It must be taken into account when addressing the legal aspects of space natural resources exploitation.

3. NEW TRENDS IN SPACE EXPLORATION AND IMPACT ON THE STUDY

3.1 EMERGENCE OF NEW ACTORS IN SPACE EXPLORATION ACTIVITIES

On 13 February 2010, in an article titled: "Space: the Final Frontier of Profit?" Peter Diamandis wrote the following in the Wall Street Journal:

> Government agencies have dominated space exploration for three decades. But in a new plan unveiled in President Barack Obama's 2011 budget earlier this month, a new player has taken center stage: American capitalism and entrepreneurship. The plan lays the foundation for the future Google, Cisco and Apple of space to be born, drive job creation and open the cosmos for the rest of us. Two fundamental realities now exist that will drive space exploration forward. First, private capital is seeing space as a good investment, willing to fund individuals who are passionate about exploring space, for adventure as well as profit. What was once affordable only by nations can now be lucrative, public-private partnerships. Second, companies and investors are realizing that everything we hold of value – metals, minerals, energy and real estate – are in near-infinite quantities in space. As space transportation and operations become more affordable, what was once seen as a wasteland will become the [venue of the] next gold rush. Alaska serves as an excellent analogy. Once thought of as "Seward's Folly" (Secretary of State William Seward was criticized for overpaying the sum of $7.2 million to the Russians for the territory in 1867), Alaska has since become a billion-dollar economy. The same will hold true for space. For example, there are millions of asteroids of different sizes and composition flying throughout space. One category, known as S-type, is composed of iron, magnesium silicates and a variety of other metals, including cobalt and platinum. An average half-kilometer S-type asteroid is worth more than $20 trillion.[48]

While this statement may seem a bit provocative, this is typically the approach currently taken by several private entrepreneurs developing business in space, and believing the private sector will play a major role. In the short to medium term, those private actors may not be able to lead space exploration and exploitation activities as they can neither afford to pay for them, nor assume the full risks associated therewith. However, in the US – and the phenomenon is limited to this country – their role and voice

[48] See Diamandis, *supra* note 37.

are increasing. As discussed below, they advocate a limited role for government and strongly support an active involvement of the private sector in space activities, including the exploitation of space natural resources.

Up until now, space exploration has been conducted by a minority of nations for purposes of enhancing national prestige, the development of space technologies and improving scientific knowledge of the Universe with particular focus on our planet Earth. Major space projects are traditionally funded by governmental entities. Over the last few years, however, the private sector has increasingly become involved in space projects. US space policy has encouraged the development of this industry with the objective of accomplishing technology breakthroughs. Following the 2003 Columbia shuttle accident, a June 2004 report [49] stressed the need to increase the involvement of the private sector. Accordingly, NASA recognizes and encourages the involvement of private industry in space operations with the specific goal of allowing private industry to assume the primary role of providing services to NASA, most immediately in accessing Low-Earth Orbit.

A recommendation made by the Aldridge Commission has also had an impact on the recent national space policy of the US, adopted under the Obama Administration. As a result, NASA is currently thinking about delegating Low Earth Orbit upload and download to the private sector. For this purpose, a lot of money has been given to private companies such as Space X. As seen below, NASA does not hesitate to conclude partnerships with the private sector in the field of space transportation, and intends to create a competitive market to supply flights to the ISS having regard to the retirement of the shuttle. Competition has been introduced in order to encourage private industry to provide reliable, cost-effective access to Low-Earth Orbit.[50] Beyond technological breakthroughs, the underlying objective is to reduce public funding. The Aldridge Commission also recommended that "Congress [should] increase the potential for commercial opportunities related to the national space exploration vision […] by creating significant monetary prices for the accomplishment of space missions." It stated further

[49] *A journey to inspire, innovate and discover* (Report of the President's Commission on Implementation of US Space Exploration Policy, June 2004) [Aldridge Report] online: NASA <http://www.nasa.gov/pdf/60736main_M2M_report_small.pdf> (date accessed: March 13, 2012).
[50] NASA, "NASA Invests in Private Sector Space Flight with SpaceX, Rocketplane-Kistler" (August 18 2006) online: NASA <http://www.nasa.gov/mission_pages/exploration/news/COTS_selection.html> (date accessed: March 13, 2012).

that "NASA should expand its Centennial prize program to encourage entrepreneurs and risk-takers to undertake major space missions."[51] In so doing, NASA looks for non-traditional sources of innovation in academia, industry and the public. Among its objectives, the program seeks to reward the achievement of returns that outweigh program investment, a feat which is not always easy to achieve in the space business.[52]

Among the most recent privately led initiatives, the X-Prize[53] was a $10 million award that went to the first team to build a private, reusable spaceship. The prize was won by Burt Rutan and Scaled Composites in 2004. The launch of SpaceShipOne in 2004 was a milestone in the commercial development of space. The advent of SpaceShipTwo (SS2) and its mothership, VMS Eve (WhiteKnightTwo) heralded a new era in commercial space flight with daily space tourism flights set to commence from Spaceport America in New Mexico after completion of the test program and after all required US government licenses have been obtained.[54] Following this success, the Google Lunar X Prize was launched. It provides a total of $30 million in a variety of categories for privately funded teams to send a robot to the Moon and perform a series of tasks by the end of 2015.[55]

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[51] The Centennial Challenges is a program of prize contests created by NASA. Its goal is to stimulate innovation and competition in NASA's space exploration program. Under the scheme, awards are given by NASA on the basis of achievements, not proposals, which provide novel solutions to NASA's mission challenges. For more details of the program, see online: NASA <http://www.nasa.gov/offices/ipp/innovation_incubator/centennial_challenges/index.html> (date accessed: March 13, 2012).

[52] Among the many topics studied within the Centennial Challenges program, the following were selected for awards in the six prize competitions released in February 2006: (1) on-orbit propellant provisioning; (2) lunar astronaut rovers and space suits; (3) advanced power storage; (4) orbital sample return; and, (5) solar sails. See "NASA's Centennial Challenges Program Seeks Input On New Prize Competitions" *Mars Today* online: Mars Today <http://www.marstoday.com/news/viewpr.html?pid=18965 > (date accessed: March 13, 2012).

[53] The X-Prize was modeled on the Orteig Prize offered in 1919 to the first pilot who could cross the Atlantic with a non-stop flight. Charles Lindbergh won the price in 1927. See The X-Prize Foundation online: X-Prize <http://www.xprize.org/> (date accessed: March 13, 2012).

[54] "Virgin Galactic unveils SpaceShipTwo, the world's first manned commercial spaceship" (December 7 2009) online: Virgin Galactic <http://www.virgingalactic.com/news/item/virgin-galactic-unveils-spaceshiptwo-the-worlds-first-commercial-manned-spaceship/> (date accessed: March 13, 2012).

[55] "The Google Lunar X PRIZE is igniting a new era of lunar exploration by offering the largest international incentive prize of all time. A total of $30 million in prizes are available to the first privately funded teams to safely land a robot on the surface of the Moon, have that robot travel 500 meters over the lunar surface, and send video, images and data back to the Earth. Teams must be at least 90% privately funded, though commercially reasonable sales to government customers are allowed without limit." See online: Google Lunar Prize <http://www.googlelunarxprize.org/prize-details> (date accessed: March 13, 2012).

Another example from the US is of relevance: the owner of the Budget Suites of America hotel chain invested up to $500 million of his personal fortune in an aerospace company. His company, Bigelow Aerospace has built a partnership with NASA and signed three "Space Act Agreements", providing for an ongoing exchange of personnel and technology, the joint testing of Bigelow projects at NASA facilities, and the transfer of NASA patents to Bigelow. One of the projects envisaged between Bigelow Aerospace and NASA is the design of an inflatable module that could become the space habitat of the future. NASA had its own inflatable habitat program called Transhab, but this was cancelled due to budgetary problems and technical challenges. Bigelow picked up where NASA left off and, in just a few years, has taken the technology far beyond the government's original program.[56] Habitat in space for any long duration will most likely require the *in-situ* use of resources.

To mention a last example, NASA created a venture with RedPlanet Capital (with an investment of $75 million) at the end of 2006 to develop technology that could help the agency to develop missions to Mars. The aim was to find companies whose technologies could also represent significant breakthroughs on Earth, as well as in the heavens.[57] These initiatives are certainly preparatory towards the future of space exploration. Long term activities in this area will lean toward space natural resources exploitation. Only few years after the start of these private lead initiatives, the interest for space natural resources exploitation is raised:

On 24 April 2012, an official public announcement was made regarding the company Planetary Resources.[58] This company is the first in the private space business to be directly dealing with the question of space natural resources exploitation. The company vision is as follows: “Planetary Resources is bringing the natural resources of space within humanity’s economic sphere of influence, propelling our future into the 21st

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[56] George Knapp, "The ultimate public-private partnership" *The Las Vegas Mercury* (July 8 2004) online: The Las Vegas Mercury <http://www.lasvegasmercury.com/2004/MERC-Jul-08-Thu-2004/24250261.html> (date accessed: March 13, 2012).
[57] Stephen Foley, "NASA seeks private investor backing for mission to Mars" *The Independent [UK]* (October 4 2006) online: The Independent <http://www.independent.co.uk/news/business/news/nasa-seeks-private-investor-backing-for-mission-to-mars-418648.html > (date accessed: March 13, 2012).
[58] See *supra* Chapter I Planetary Resources, Inc. Press Conference, April 24, 2012. Link to the official announcement available from the company website, online: <http://www.planetaryresources.com/>. (date accessed: March 13, 2012).

century and beyond. Water from asteroids will fuel the in-space economy, and rare metals will increase Earth's GDP."[59]

With the technological breakthroughs made in recent years, and the slow decision-making process of governmental space agencies, private actors – mainly American millionaires – are initiating private projects in space. The motivation behind this is the "high frontier", some of them believing they can even create a real business. These new initiatives have certainly had a great impact on the public and also on the traditional space sector, led by governments. However, those that have succeeded so far (mainly the company Space X) have received large governmental subsidies at some point in their development, including in-kind support (for example, the free use of government-owned space facilities). It would therefore be misleading to state that space has become solely a privately-owned business. The next few paragraphs explore the link between this new public-private partnership approach in space and its potential impact on the exploitation of space natural resources.

3.2 THE IMPACT OF THE NEW TREND OF PUBLIC-PRIVATE PARTNERSHIPS ON THE EXPLOITATION OF SPACE NATURAL RESOURCES

The space activities mentioned above are governed by a special legal regime at the international level (notably the Outer Space Treaty[60] and the Liability Convention[61]) and, at the domestic level, by national laws and regulations. In the US, the Office of Commercial Space Transportation was created within the Federal Aviation Administration (FAA) in 1984 to regulate these activities.[62] The US administration has since adapted its mechanism to support the development of the new business. For

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[59] See the company mission objective, Planetary Resources, online :<http://www.planetaryresources.com/mission/>.

[60] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, 610 UNTS 205, 18 UST 2410, TIAS No. 6347 [*Outer Space Treaty*].

[61] *Convention on International Liability for Damage Caused by Space Objects*, 29 March 1972, 961 UNTS 187, 24 UST 2389, TIAS 7762 [*Liability Convention*].

[62] "The Office of Commercial Space Transportation (AST) was established to: Regulate the U.S. commercial space transportation industry, to ensure compliance with international obligations of the United States, and to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States; Encourage, facilitate, and promote commercial space launches and reentries by the private sector; Recommend appropriate changes in Federal statutes, treaties, regulations, policies, plans, and procedures; and Facilitate the strengthening and expansion of the United States space transportation infrastructure." See online: Federal Aviation Authority (FAA) (US) <http://www.faa.gov/about/office_org/headquarters_offices/ast/about/>. (date accessed: March 13, 2012).

example, it issues FAA licences for commercial launches of orbital and suborbital rockets. It is significant to note that the US regulatory regime was established and was functioning even before the commencement of the regulated activities; i.e., the US regulator anticipated the development of new space activities. In 2012, suborbital flights have not yet commenced, however the office was set up in 1984 and regulations were drafted shortly thereafter. Using this analogy, it would be prudent that the exploitation of space natural resources be governed by a legal framework that anticipates how things will unfold in this area of space activities.

Several actors have openly rejected the current legal framework of international space law. The strongest opponent of the present legal framework is Dennis Hope who has created a website to commercialize parcels of the Moon.[63] For him, the non-appropriation principle of the Outer Space Treaty is only applicable to governments, and not to private entities. He did not hesitate to make a declaration to the UN in 1980, claiming ownership on the Moon. As a consequence, selling pieces of the Moon on the internet is a legal business for him.[64] Since private ownership is not explicitly addressed in the Outer Space Treaty, some authors have been hasty to draw conclusions: "The first legal frame[work] for the Moon was brought [about] by the 1967 Outer Space Treaty but specialists agree that there is a loophole as it does not mention anything about private ownership."[65] Finally, as mentioned above in the present Chapter, the Space Settlement Institute has clearly stated its opposition to the provisions of current space treaties. Their website contains the following statement:

> It is our belief that private industry, not government, must assume the lead in space settlement efforts. The Institute's mission includes: Identification of financial and other incentives to motivate private industry to fulfill such a role;

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[63] You recently bought few acres of the Moon on the internet. You paid US$22.49, plus a lunar tax of US$1.51 per acre. The shipping and handling cost are US$12.50. A few days later, you receive the following "Lunar Deed", with your name printed on it as below: the Lunar Embassy guarantees that you have a prime view of planet Earth from your property on the Moon. Acres of the Moon can be bought via the Lunar Embassy online: <http://lunarembassy.com/lunar/shops.lasso?-database=aa654s5677556pr&-layout=US$_pr9981_en&-response=index_e.lasso&-NoResultsError=index_e.lasso&-token.affindex=&-token.trackindex=1989915&-token.rn=71405892&-token.cs=US$&-token.rs29=33&-token.rscd=LE&-token.firstlogin=&-token.skip=&-show> (date accessed: March 13, 2012) [Lunar Embassy].

[64] *Ibid*. (Date accessed: March 13, 2012).

[65] Philippe Dozolme, "A Consensus Position Emerges on Moon Resources Ownership" online: About.com <http://mining.about.com/od/InnovationTechnology/a/A-Consensus-Position-Emerges-On-Moon-Resources-Ownership.htm> (date accessed: March 13, 2012).

> Removal of regulatory, legal, and psychological barriers to private sector efforts in space.[66]

These statements not only provide wrong information about the applicable law, but contribute to spreading negative perceptions about the regulation of outer space. As a result of such statements, many people perceive international space law as a hindrance to the development of new activities such as exploitation of resources. Some authors[67] are quick to conclude that States and private operators may not have started exploitation of space natural resources because of the non-existence of international rules on the exploitation of space natural resources.

The question that arises is: what legal regime would be most appropriate to address this new trend in space? If the risks are transferred to the private sector, does it mean that changes must be made to the current legal framework? Although there are some regulations governing space transportation, there are no dedicated rules on the exploitation of space natural resources. With the increased involvement of new actors, particularly from the private sector, there is the need to ensure that the legal framework adopted satisfactorily addresses the concerns of all stakeholders. Before addressing the legal aspects, an analysis of the strategies and policies followed by current space nations will show that exploitation of the resources will soon become inevitable.

III. THE EXPLOITATION OF SPACE NATURAL RESOURCES IS ON THE VERGE OF BECOMING FEASIBLE

At the end of the 20th Century, the US was still the most active State involved in space science and exploration while other States (China and India notably) were acquiring technologies and developing their own space ambitions. A new trend has developed since the commencement of the 21st Century. There has been a renewed dynamic in space exploration and the quest for resources has ensued. States that were hitherto not actively involved in space exploration have since become (or are in the process of becoming) real competitors. This section analyzes the relevance of space natural resources in the space exploration programs of major space faring nations. After presenting a historical

[66] See online: Space Settlement Institute <http://www.space-settlement-institute.org/> (date accessed: March 13, 2012).
[67] Fabio Tronchetti, *The exploitation of natural resources of the Moon and other celestial bodies: A proposal for a legal regime*, (Leiden/Boston: Martinus Nijhoff, 2009) at 3 [Tronchetti].

overview of various space exploration programs, the focus of the remainder of this chapter is directed towards a simple yet imminent fact, namely: that the exploitation of space natural resources is on the verge of becoming feasible. As such, this is the right time to define an appropriate international legal framework in fulfillment of the requirements of the Moon Agreement.[68]

1. HISTORICAL OVERVIEW OF SPACE EXPLORATION PROGRAMMES AND THE RELEVANCE OF SPACE NATURAL RESOURCES

As demonstrated below in a synthetic fashion, the *exploration* (as opposed to *exploitation*) of space natural resources has traditionally formed part of the international programmes of the main space faring nations. Created in 1958, NASA[69] has led major space programs in the US including: human space flight initiatives to ascertain the reaction of human bodies to the space environment (Project Mercury); rendezvous and docking of spacecraft and extravehicular activity (EVA) with two astronauts (Project Gemini) and Apollo missions to explore the Moon. NASA also conducted various robotic missions to the Moon (Ranger, Surveyor, and Lunar Orbiter) and around 20 Moon precursor missions between 1961 and 1968, to Venus (Pioneer Venus), Mars (Mariner 4, Viking 1 and 2), and to the more distant edge of the Solar System (Pioneer 10 and 11, Voyager 1 and 2). These missions helped NASA scientists to learn more about the outer planets.

In the 1970's, NASA launched several scientific spacecraft and landers (from Pioneer and Voyager missions to the Mars Global Surveyor and Mars Pathfinder). While exploration of the Moon was initially conceived as a political means to demonstrate US technological superiority to the Soviets during the Cold War, it nevertheless helped the US to understand the origin of the Moon and to learn about its natural resources. Following the end of the Cold War, national space programs have focused a lot less on Low Earth Orbit missions, and the ISS program has suffered major financial and technical difficulties (loss of Challenger in 1986 and Columbia in 2003). The loss of Columbia marked the beginning of a major transition in the US space program.

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[68] *Agreement Governing the Activities of states on the Moon and other Celestial Bodies*, 18 December 1979 1363 UNTS 3, 18 ILM 1434, art 11(7) [*Moon Agreement*].
[69] See online: NASA <http://history.nasa.gov/factsheet.htm> (date accessed: March 13, 2012).

Between 1959 and 1976, the USSR conducted around 15 Luna missions with a series of spacecraft that studied the Moon with a variety of instruments, either orbiting or landing on the surface of the Moon. Zond missions were also launched by Russia to study the Moon, taking photographs of the near and far sides of the Moon. Up to 15 Venera missions were conducted between 1967 and 1983 to study the atmosphere and surface temperature of the planet Venus. Phobos 1 and 2 were spacecraft designed to study the interplanetary environment; perform observations of the Sun; conduct surface and atmospheric studies of Mars; and, study the surface composition of the Martian satellite Phobos. Several Mars orbiters and the Vega Venus Comet Halley probe formed part of Russian historic achievements.[70]

In 1990, Japan launched Muse-A, thereby becoming the third country (after the US and the USSR) to launch a mission to the Moon. PLANET-B, the first Japanese Mars orbiter was launched in 1998 and was renamed NOZOMI. Unfortunately, the spacecraft failed on its way to Mars as a result of which the mission was never achieved.

Europe has accomplished major achievements in space science and exploration within the framework of the European Space Agency (ESA). The Giotto Comet flyby mission took place in 1986. In 1989, Europe launched the Galileo probe in cooperation with the US to orbit Jupiter and study its atmosphere and satellites. In 1990, Europe collaborated again with the US to launch the Ulysses mission to study the poles of the Sun and the interstellar space above and below the poles. This was followed in 1995 by the launch of SOHO, a solar probe to study the Sun's internal structure. In conjunction with the Italian Space Agency and the US, ESA conducted the Cassini-Huygens mission to Saturn. This was a major planetary mission.[71] The Mars Express spacecraft was launched in June 2003 and reached Martian orbit in December 2003. The orbiter includes a scientific payload to conduct analysis of the surface, sub-surface and atmosphere of Mars. Launched in November 2005, Venus Express reached its final orbit in May 2006.

[70] For a history of the exploration program, see online: Solar Views <www.solarviews.com/eng/history.htm> (date accessed: March 13, 2012).

[71] A scientific probe called Huygens was released from the main spacecraft to parachute through the atmosphere to the surface of Saturn's largest and most interesting moon, Titan. Cassini Huygens was launched in October 1997. It arrived on Saturn in July 2004. Huygens was released from Cassini on December 25, 2004 and sent its measurements and images to Cassini, which relayed data onwards to Earth. Cassini will be orbiting Saturn during four years. See online: European Space Agency <http://sci.esa.int/science-e/www/area/index.cfm?fareaid=12>. (date accessed: March 13, 2012).

The SMART-1 spacecraft conducted observations of the Moon until September 2006, giving the scientific community significant information on the chemical composition of the Moon's surface.

The "Aurora" program[72] was Europe's main initiative in space exploration. It was initiated in 2001 following a large consultation amongst the European scientific community. Its primary objective was to create and implement a long-term European plan for robotic and human exploration of the solar system, with Mars, the Moon and the asteroids as the most likely targets. A second objective was to search for life beyond the Earth. Scientific objectives included search for traces of past and present life on Mars; characterization of the water and the geochemical environment as a function of depth in the shallow subsurface; as well as studies on Mars' surface and deep interior to understand the evolution and habitability of the planet.

Space exploration and space physics studies commenced in China in the 1970's. In line with the needs of the country, China developed a fleet of satellites for space applications along with the Long March family of launchers. Based on its close relationship with Russia, China obtained immense technical assistance from Russia to develop its space infrastructure and technology, including its human space flight program. With regard to deep space exploration, China launched Chang'e-1 in 2007 to provide a map of the Moon and also to evaluate Helium 3 resources.[73] Launched in 2010, Chang'e-2 carried more sophisticated instruments on board. This mission also aims at enabling Chinese scientists to better understand the Moon. According to one commentary, Chang'e-2 has "created a full higher-resolution map of the [M]oon, and a high-definition image of Sinus Iridium, and completed several extended tests, including circling the Lagrangian Point L2, which laid the foundation for future deep-space exploration

[72] ESA Aurora Space Exploration programme, ESA online: <http://www.esa.int/SPECIALS/Aurora/index.html>. See also ESA, "ExoMars, Searching for life on the Red Planet" *ESA Bulletin* vol. 126 (May 2006) online: ESA <http://www.esa.int/esapub/bulletin/bulletin126/bul126c_vago.pdf > (date accessed: March 13, 2012).

[73] See online: NASA <http://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=2007-051A> (date accessed: March 13, 2012).

tasks."[74] Space natural resources continue to be relevant in worldwide space exploration programs.

2. THE EXPLOITATION OF SPACE NATURAL RESOURCES WILL SOON BECOME INEVITABLE

There has been a renewed interest in space exploration programmes since the beginning of the 20th Century. Countries are preparing – although at different speeds – the future of space exploitation where resources exploitation will be a necessary part. In the US, the loss of the shuttle Columbia in 2003 caused a lot of damage to NASA's spaceflight program. By way of political reaction to the disaster and its aftermath, President George W. Bush announced a new vision for space exploration from the NASA Headquarters in January 2004, envisioning the return of American astronauts to the Moon, a matter of great relevance for space natural resources.

The fundamental goal of the new vision[75] for space exploration was to advance US scientific, security, and economic interests through a robust space exploration program. In support of this goal, the US would: "implement a sustained and affordable human and robotic program to explore the solar system and beyond; extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations; develop innovative technologies, knowledge, and infrastructure both to explore and to support decisions about the destinations for human exploration; and, promote international and commercial participation in exploration to strengthen US scientific, security, and economic interests." NASA was charged with the implementation of the vision. [76]

In the 2004 vision, it was envisaged that the first extended human expedition to the Moon would be conducted as early as 2015 but no later than the year 2020. Lunar

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[74] China's Space Activities in 2011. Information Office of the State Council. The People's Republic of China. December 2011. Beijing. Compiled and Released for Reference Purposes by SpaceRef Space News and Reference. Spaceref online: <http://images.spaceref.com/china/ChinaSpaceActivitiesin2011.pdf>. (date accessed: March 13, 2012).

[75] The objectives of the vision for space exploration can be found in "A Bold Approach for Space Exploration and Discovery - Fact Sheet on the President's April 15th Address in Florida" online: The White House <http://www.whitehouse.gov/sites/default/files/microsites/ostp/ostp-space-conf-factsheet.pdf> (date accessed: March 13, 2012).

[76] NASA's Exploration Systems Mission Directorate (ESMD) Mission is derived from the vision for space exploration. See online: NASA http://www.nasa.gov/exploration/about/esmd_mission.html (date accessed: March 13, 2012).

exploration activities would be used to advance science, and to develop and test new approaches, technologies, and systems, including the use of lunar and other space resources, to support sustained human space exploration missions to Mars and to other destinations. As such, the use of lunar and other space resources was clearly stated as an objective of the vision. The utilization of space resources was considered a sustainable approach to support future human exploration missions to Mars and other space destinations.[77] Pursuant to the vision, NASA launched the Lunar Reconnaissance Orbiter (LRO) on June 18, 2009. The objective[78] of the LRO mission is to conduct targeted investigations specifically designed to prepare for, and to support, future human exploration of the Moon and, as well, to assess potential space natural resources.[79]

NASA's Phoenix mission to Mars was launched in August 2007 with the objective of collecting and sampling water ice with a robotic arm. The spacecraft landed on the icy northern polar region of Mars in May 2008.[80] Phoenix's first objective is to study all phases of the history of water on Mars. It is therefore the first mission to collect meteorological data in the Martian arctic needed by scientists to accurately model Mars' past climate and to predict its future weather processes. Its second objective is to search for evidence of habitable zones on Mars and to assess the biological potential of the ice-soil boundary. Its scientific goals are to determine if life support conditions may have existed or do exist on Mars.

NASA is conducting major space programs to search for water and life on Mars, using robots. Studies show that simple life forms may have existed on Mars in the past and may still be present under the surface.[81] The success of "Spirit" and "Opportunity", two rovers that landed on Mars in January 2004 is an amazing illustration of those

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[77] In "Lunar Testbeds and Missions" page 7, in The Vision for Space Exploration, February 2004, NASA HQ publication, NASA online : < http://www.nasa.gov/pdf/55583main_vision_space_exploration2.pdf>
[78] See online: NASA <http://www.nasa.gov/mission_pages/LRO/main/index.html> (date accessed: March 13, 2012).
[79] "LRO will employ six individual instruments to produce accurate maps and high-resolution images of future landing sites, to assess potential lunar resources, and to characterize the radiation environment." See Gordon Chin *et al*, "Lunar Reconnaissance Orbiter Overview: the Instrument Suite and Mission" [2007] 129:4 Space Science Reviews 391 online: Springerlink <http://lunar.gsfc.nasa.gov/library/lro_space_science_paper.pdf> (date accessed: March 13, 2012)
[80] See online: NASA <http://www.nasa.gov/mission_pages/phoenix/main/index.html> (date accessed: March 13, 2012).
[81] *Supra* note 75.

successes. Launched in November 2011, the Mars Science Laboratory mission,[82] a robotic exploratory effort of NASA, is arrived on Mars on 6 August 2012. As part of the mission, the rover "Curiosity" is designed to examine the habitability of Mars. The rover is conducting scientific studies by analyzing Martian samples to detect the existence of chemical building blocks of life and by assessing what the Martian environment was like in the past. NASA envisions deploying more robotic missions to Mars in order to drill into the surface of Mars and return samples to Earth. New technologies will allow precision landing and resource extraction and utilization.

The objectives of the vision for space exploration were extremely ambitious and a new orientation for NASA's future space exploration programs. NASA's exploratory programs designed to search for life in space have not been limited exclusively to Mars. Currently, NASA is undertaking a project focusing on scientific studies of space natural resources. All these programs are part of preparatory efforts preceding the exploitation of space natural resources. In a speech delivered in December 2006, Shana Dale, former Deputy Administrator of NASA expressed the opinion that the "pioneers of the 21st Century will have to learn to live off the land, extracting the resources they need *in-situ*."[83]

Upon assuming office, the Obama administration made some changes to the previous vision for space exploration. Although the main Constellation programme was cancelled due to financial constraints, some strong ambitions have remained (along with the relevant funding) to prepare for the future of space exploration. NASA has chosen a new long-term goal: the objective is to invest in research and technologies to enable humans to safely reach multiple potential destinations, including the Moon, asteroids, Lagrange Points and their environs. It is foreseen that *in-situ* resources utilization programs will be established.[84] In a speech[85] delivered on 15 April 2010 at NASA's John

[82] Mars Science Laboratory is part of NASA's Mars Exploration Program, a long-term effort of robotic exploration of the red planet. Mars Science Laboratory is a rover that will assess whether Mars ever was, or is still today, an environment able to support microbial life. In other words, its mission is to determine the planet's "habitability." See online: NASA <http://marsprogram.jpl.nasa.gov/msl/> (date accessed: March 13, 2012).

[83] Shana Dale, "Exploration Strategy and Architecture" Presentation delivered at the 2nd Space Exploration Conference (December 4, 2006).

[84] See online: NASA <http://www.nasa.gov/pdf/420990main_FY_201_%20Budget_Overview_1_Feb_2010.pdf> (date accessed:

F. Kennedy Space Center, President Obama remarked on space exploration in the 21st Century, noting that: "We're no longer racing against an adversary. We're no longer competing to achieve a singular goal like reaching the Moon. In fact, what was once a global competition has long since become a global collaboration." President Obama announced the following ambitious projects:

> We will ramp up robotic exploration of the solar system, including a probe of the Sun's atmosphere; new scouting missions to Mars and other destinations; and an advanced telescope to follow Hubble, allowing us to peer deeper into the universe than ever before. Early in the next decade, a set of crewed flights will test and prove the systems required for exploration beyond low Earth orbit. And by 2025, we expect new spacecraft designed for long journeys to allow us to begin the first-ever crewed missions beyond the Moon into deep space. So we'll start by sending astronauts to an asteroid for the first time in history. By the mid-2030s, I believe we can send humans to orbit Mars and return them safely to Earth. And a landing on Mars will follow. And I expect to be around to see it.

While US administrations may change, the ambitions remain. Subsequent space missions to explore other planets will contribute to the understanding of the space natural resources which will be utilized.

Exploration has an important place in Russia's national space policy and programs planned for the period 2006-2015.[86] In the field of space research, the objectives of the Phobos-Grunt mission were to collect soil samples from Phobos, a satellite of Mars, and to return those samples to Earth for comprehensive scientific research into Phobos, Mars and Martian space. The mission would have included both *in-situ* and remote studies of Phobos, including laboratory analysis of the soil samples; monitoring of the planet Mars, including the holistic dynamic behaviour of its atmosphere and dust storms; studies of Martian surroundings, including plasma and dust components, and its radiation

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March 13, 2012). NASA will fund research in a variety of ISRU activities aimed at using lunar, asteroidal, and Martian materials to produce oxygen and extract water from ice reservoirs. A flight experiment to demonstrate lunar resource prospecting, characterization, and extraction will be considered for testing on a future Flagship Technology Demonstration or robotic precursor exploration mission. Concepts to produce fuel, oxygen, and water from the Martian atmosphere and from subsurface ice will also be explored

[85] The White House, Press release, "President Barack Obama on Space Exploration in the 21st Century" (April 15 2010) online: NASA <http://www.nasa.gov/news/media/trans/obama_ksc_trans.html> (date accessed: March 13, 2012).

[86] Yevgeny Zvedre, "Russia in Space" Presentation delivered at the Houston Space Exploration Conference, (December 5, 2006) online: NASA <http://www.nasa.gov/mission_pages/exploration/main/2nd_exploration_conf.html> (date accessed: March 13, 2012).

environment. Unfortunately, the mission suffered a major failure after it was launched, never left low Earth orbit and fell back to Earth on 15 January 2012.[87]

The objectives of Russia's Luna-Glob mission are to acquire data on the internal structure of the Moon and its South Pole crater Itkena; to investigate the natural resources of the Moon and the influence of electromagnetic radiation. The lunar orbiter will fire 12 penetrators into different areas of the Moon to create a seismic network, which will be used to study the Moon's origin. After firing the penetrators, the mother ship will deliver a polar station equipped with a mass spectrometer and neutron spectrometer to the surface. The objective of the polar station is to detect water ice deposits in the polar zones of the Moon.[88] The mission is planned for 2014 or 2015.[89] The objectives of the VENERA-D mission, planned to be launched in the coming years,[90] are: to measure the chemical composition of the atmosphere of planet Venus; to take pictures of its surface; to determine its mineral structure; and, to take exact measurements of temperature, pressure and radiation characteristics in its environment as well as of the seismic activity of the planet.

Apart from Russia and the US, other countries have also developed plans that emphasize the importance of exploration of space natural resources. In 2005, JAXA the Japanese national space agency[91] developed its own vision known as "Vision 2025."[92] The JAXA vision establishes the goals and aspirations of the aerospace sector for the 20

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[87] Mike Wall, "Russian Mars Moon Probe Suffers Big Failure After Launch" Spacve.com (November 8, 2011) online: Space.com <http://www.space.com/13554-russia-mars-moon-phobos-grunt-failure.html>; See also "Phobos-Grunt failure won't affect scheduled launches-officials" The Voice of Russia online: <http://english.ruvr.ru/2011/11/09/60129347.html> (date accessed: March 13, 2012)

[88] See online: NOVOSTI <http://en.rian.ru/science/20061207/56591477.html> (date accessed: March 13, 2012).

[89] David Warmflash, "Russian Lunar Exploration Program at Full Speed, Despite Failure of Mars Moon Probe" *Universe Today* (December 15, 2011) online: Universe Today <http://www.universetoday.com/91832/russian-lunar-exploration-program-at-full-speed-despite-failure-of-mars-moon-probe/> (date accessed: March 13, 2012).

[90] See Anatoly Zak, "Origin of the Venera-D project" (September 6 2011) online: RussianSpaceWeb.com <http://www.russianspaceweb.com/venera_d.html> (date accessed: March 13, 2012).

[91] In 2004, three Japanese space agencies merged to create the Japan[ese] Aerospace Exploration Agency (JAXA).

[92] JAXA's vision is to: "Develop launch vehicles and satellites with the highest reliability and world class capability, contributing to the realization of a secure and prosperous society. Promote "top science" in the field of space science while preparing for Japan's own human space activities and the utilization of the Moon. Conduct flight demonstration of a prototype hypersonic vehicle with the cruising speed at Mach 5. With all of the above activities, contribute to turning the aerospace industry into a key industry." See online: JAXA <http://www.jaxa.jp/about/2025/pdf/summary_e.pdf> (date accessed: March 13, 2012).

year period spanning from 2005 to 2025. Vision 2025 details JAXA's exploration strategy in different steps,[93] and space exploration plays a major role in each of them. Under Vision 2025, Japan aims to turn itself into a "top science center" for space science; to develop sound technologies for the establishment and utilization of a lunar base; and, to establish a "deep space harbor" on the Moon and/or a Lagrange Point in the future. Japan also plans to: promote studies and possible utilization of the Moon; expand the scope of its activities; develop cutting-edge technologies such as robotics technologies, nanotechnologies and micro-machines and power - providing technologies using solar power; prepare for the establishment of a human lunar base; and, develop complementary relationships with other nations for effective exploration of space. The vision envisages that further exploration of the Moon with Moon-orbiting satellites will take place within the first 10 years. In this timeframe, Japan will also seek a decision by the government on whether to take significant steps toward the utilization of the Moon. After 20 years, the Vision expects Japan to contribute to the international community by taking up roles in the implementation of international lunar initiatives.

The objective of the JAXA's Selenological and Engineering Explorer mission (SELENE)[94] is to understand the Moon's origin and evolution. Already, the mission has conducted studies of the Moon with 14 different instruments. It will further investigate the Moon to obtain information on its composition, geography, surface and sub-surface structure.[95] It will also help to define whether the use of the Moon's natural resources is possible in the future. SELENE is considered by JAXA as the largest lunar mission since the Apollo program. Beyond SELENE, plans are that the SELENE-2 and 3 missions will study smaller portions of the Moon. SELENE-2 will be equipped with a rover that will conduct *in-situ* studies. SELENE-3 is not clearly defined yet. However, there is a possibility that the mission will return samples from the Moon or conduct studies of water

[93] These steps are as follows: (1) Contribute to building a secure and prosperous society through the utilization of aerospace technologies; (2) Contribute to advance our knowledge of the universe and broaden the horizon of human activity; (3) Develop the capability to carry out autonomous space activities through the best technologies in the world; (4) Facilitate growth of the space industry with self-sustenance and world class capability; and (5) Facilitate the growth of aviation industry and aim for technological breakthroughs for future air transportation.
[94] Launched in September 2007.
[95] See online: JAXA <www.jaxa.jp/missions/projects/sat/exploration/selene/index_e.html> (date accessed: March 13, 2012).

and oxygen on the Moon for future exploitation. Japan also conducted exploration of asteroids and JAXA's Hayabusa mission was the first mission to return a sample from an asteroid. The Japanese space agency launched in January 2012 an international announcement of opportunity related to the study of the samples.[96]

Finally, Japan is a joint participant with the ESA in the Mercury exploration mission known as BepiColombo. This mission will conduct comprehensive observations of planet Mercury that will help to determine how much it has in common with other planets and what elements are unique to Mercury as well as the origin and evolution of other planets.[97]

The current strategy of the Canadian Space Agency (CSA) is to better understand the Solar System and the Universe; to seek signs of life in extraterrestrial habitats, and to prepare for a permanent human presence in space and on other planets. In its effort to better understand the solar system and to develop space infrastructure, Canada is particularly interested in research focusing on the Martian atmosphere, terrestrial analogues and the search for life on Mars. Since Canada has extensive experience in robotics, its goal is to maintain and further develop such capabilities including advanced mobility and in-orbit servicing systems. Canada is participating in NASA's Mars Sample Laboratory mission described above as well as the European ExoMars mission and the US asteroid sample return mission, OSIRIS-REx[98]. Within its robotic exploration program, Canada is planning to develop drilling and excavating capabilities to extract subsurface samples and conduct in-situ study of resources. In order to prepare for future exploration missions, dedicated sites in Canada where simulated conditions are analogous to those existing on the Moon and Mars are used. Canadian laboratories are testing technologies (e.g., drilling, rover navigation) and scientists are simulating water search, water-related land forming and search for life at those sites.

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[96] JAXA Press Release: 1st International Announcement of Opportunity for Hayabusa sample investigation (24 January 2012). JAXA website online: <http://www.jaxa.jp/press/2012/01/20120124_hayabusa_e.html>. (date accessed: March 13, 2012).
[97] *Ibid*.
[98] See the OSIRIS-Rex mission website online: <http://osiris-rex.lpl.arizona.edu/>. (date accessed: March 13, 2012).

In Europe, the current priorities of the European Space Agency are its Cosmic Vision program and ExoMars. Created in 2005, the Cosmic Vision program is the continuation of ESA's previous plans in space science. It includes several themes (e.g., planets and life, the solar system, fundamental laws and the universe).[99] Under the planets and life theme, the aim of the Cosmic Vision program is to find evidence of life. The goal is to "explore *in-situ* the surface and subsurface of solid bodies in the Solar System most likely to host – or have hosted – life." Planned missions include the exploration Mars with landers and sample return.[100]

If the project is able to overcome its difficulties, the first ExoMars mission will be launched in 2016 by placing a spacecraft in orbit around Mars to measure details of trace gases in the Martian atmosphere and to act as a telecommunications relay for future missions. A descent module will be part of the overall package and will place a small Mars lander on the surface of the planet to conduct limited experiments, however, the main goal of this lander is to test entry, descent and landing (EDL) technology. A rover planned for the second ExoMars mission in 2018 would collect samples from different sites and conduct measurements to determine the past or present existence of life on Mars.[101] The current ExoMars program will be conducted in partnership with Russia. A Mars Sample Return program is envisioned to be implemented after 2020, in cooperation with partners including Russia and the US.

The launch of a Chinese taikonaut in 2003 marked a major milestone in the development of China's space program. With respect to Mars, China was also involved in the failed Russian Phobos-Grunt project described above. Over the next five years, China plans to conduct "deep-space exploration in stages, with limited goals. Based on the idea of 'three steps' - orbiting, landing and returning - for continuing lunar probe projects, China will launch orbiters for lunar soft landing, roving and surveying to implement the second stage of lunar exploration. In the third stage, China will start to conduct sampling

[99] For more details about ESA's Cosmic Vision, see online: ESA <http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=40794>. (date accessed: March 13, 2012).
[100] See online: ESA <http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=38646> (date accessed: March 13, 2012).
[101] For more details about the ExoMars mission, see online: ESA <http://www.esa.int/SPECIALS/ExoMars/SEM10VLPQ5F_0.html> (date accessed: March 13, 2012).

[of] the [M]oon's surface matter and get those samples back to Earth."[102] In the development of policies and measures, China's objectives 2011 included the creation of a legislative environment favourable to the development of space activities, and the support of peaceful uses of outer space within the framework of the United Nations.[103] Space natural resources will play a key role of this exploration strategy. Ouyang Ziyuan, chief scientist of China's lunar exploration programme, told The People's Daily that the Moon "probably holds the key to humanity's future subsistence and development". Luan Enjie, director of China's National Space Administration, mentioned that China would be interested in exploiting rare resources found on the Moon's surface.[104]

Building upon decades of experience in space applications, India is now moving towards space science and exploration. India is planning to launch scientific missions in space on a regular basis and is also planning a human spaceflight program in the not too distant future. The first scientific mission was Chandrayaan-1, launched in October 2008. This was an unmanned mission to the Moon. Its objectives[105] were to: advance Indian technological capabilities and experience; prepare India for future applications of the Moon; inspire Indian youth to study science and technology; and, develop high resolution remote sensing images of the Moon, to map out the Moon in terms of elements, minerals and topography.

During a scientific conference held in November 2006, a group of experts (both space and non-space scientists) suggested five future missions for India. However, none of the suggestions have been formally approved by the government as yet, although a follow-up mission to the Moon in 2013 (Chandrayaan-2)[106] with an orbiter and a lander has been proposed. Considering the country's current needs, the question is whether the decision-makers will give sustainable support to those projects. Decisions will also probably depend on the evolution of the international context. The objective of the

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[102] See *supra* note 72.
[103] *Ibid*.
[104] Will Knight, "China plans three-phase Moon exploration" *New Scientist* (3 March 2003) online: New Scientist <http://www.newscientist.com/article.ns?id=dn3452> (date accessed: March 13, 2012).
[105] For more details about the Chandrayaan-1 mission, see online: <http://www.chandrayaan-1.com/goals.htm>. See also online: ISRO <http://www.isro.org/Chandrayaan/htmls/home.htm> (date accessed: March 13, 2012).
[106] See online: <http://www.chandrayaan-i.com/index.php/chandrayaan-2.html> (date accessed: March 13, 2012).

proposed Chandrayaan-2 mission will be to study specific sites such as the far side of the Moon. In addition, an asteroid comet flyby mission could take place around 2015, and a mission to Mars is envisaged before 2019. India's first manned mission is planned for 2014. It would be a human mission to Low-Earth Orbit and it will be followed by a mission to the Moon in 2020.[107] There are plans to launch a Mars orbiter by 2015 and to send humans into deep space.

IV. CONCLUSION

The foregoing discussion clearly demonstrates that in the national space policies and programs of all the countries that are currently active in space, there is a predominant focus on space exploration. However, beyond space exploration, a major common objective is found in the desire to learn about space natural resources in order to determine their utility and relevance for purposes of future exploitation. In today's space exploration programs, the quest for knowledge about space natural resources is a priority. Exploitation of space natural resources has not yet occurred, but it has clearly become feasible. When exploitation of space natural resources begins, the transformation of those resources will become necessary and the legal issues and implications arising from their exploitation will be critical. Thus, the precise requirement established by the Moon Agreement for the elaboration of an international regime to govern the exploitation of space natural resources has been fulfilled necessitating the immediate commencement of efforts at the international level to establish such a regime.

[107] Maggie McKee, "Indian scientists support human space mission" *New Scientist* (8 November 2006) online: New Scientist <http://space.newscientist.com/article/dn10475-indian-scientists-support-human-space-mission.html> (date accessed: March 13, 2012).

CHAPTER III – THE APPLICABILITY AND RELEVANCE OF EXISTING INTERNATIONAL SPACE LAW TO THE EXPLOITATION OF SPACE NATURAL RESOURCES

I. INTRODUCTION

The search for understanding of our planet Earth and the exploration of other celestial bodies naturally involves learning about space natural resources. The first Chapter has demonstrated that even if we are not going to witness extensive exploitation of space natural resources in the short term, it will happen one day. Such a development in an international area has a political impact and it is important to anticipate and address the implications thereof in order to avoid international conflict. Considering the political dimension of such a development and the consequences it may have if the global community is not properly prepared, the indispensable next step is to focus on the legal aspects and keep in mind the consequences for current and future actors. While the existence of legal rules in and of itself does not prevent tensions from occurring, an international legal framework is still necessary to govern this type of activity at the very minimum. As analysed in Part II, efforts to craft international legal regimes to deal with similar issues in the Antarctic and High Sea were hard to accomplish, demonstrating the relevance of the exercise.

The objective of this present Chapter is to assess whether the existing regime of international space law satisfactorily addresses the political dimension of space natural resources exploitation. An analysis of the applicable space law principles is conducted by way of a comparative analysis between the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty)[1] and the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement).[2] The latter Agreement has not been ratified by many of the main space faring nations.

[1] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, 610 UNTS 205, 18 UST 2410, TIAS No. 6347 [*Outer Space Treaty*].
[2] *Agreement Governing the Activities of states on the Moon and other Celestial Bodies*, 18 December 1979 1363 UNTS 3, 18 ILM 1434 [*Moon Agreement*].

Despite the renewed global interest in space exploration, as demonstrated for example in the US' vision for space exploration of January 2004 and the international impact thereof, the international legal issues related to the exploitation of space natural resources and the status of the Moon Agreement have not been addressed at the United Nations. It was not until a few years ago that the subject became of interest to the United Nations Committee on the Peaceful Use of Outer Space (COPUOS). In April 2008, Austria, Belgium, Chile, Mexico, the Netherlands, Pakistan and the Philippines submitted a joint statement[3] to the COPUOS Working Group on the Status and Application of the Five United Nations Treaties on Outer Space on the benefits of adherence to the Moon Agreement by States Parties. Similar actions had taken place in the past under the initiative of the United Nations Office of Outer Space Affairs (UNOOSA). However, the 2008 joint statement was unique in the sense that it marked the first time that such an initiative had been made by States. Furthermore, the proponents of the joint statement consisted of nations that, at the time, neither had any past space activities, nor future plans for significant exploration programs. As such, their initiative was even the more original.

The rationale behind the Joint Statement has been described as follows: it is first considered that some States regularly question whether the [Moon] Agreement is part of international law or should be considered to be on the same level as the four other United Nations Treaties on outer space; the text was commended by the General Assembly in its resolution 34/68 of 5 December 1979 in which the Assembly expressed its hope for the widest possible adherence to the Agreement; the fact that the text entered into force on 11 July 1984 and since then, [has become] part of international law; the growing interest among space-faring countries worldwide in new projects, activities and missions aimed at exploring and using the Moon and other celestial bodies in the Solar System and their resources was taken into account and the fact that the Agreement offers a specific international legal framework commended by the General Assembly. The Joint statement stressed that on the one hand, the Moon Agreement contains provisions that reiterate or develop the principles set out in the Outer Space Treaty, on the other hand, it also

[3] United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Legal Sub-Committee, *Joint statement on the benefits of adherence to the Agreement governing the Activities of States on the Moon and Other Celestial Bodies by States Parties to the Agreement* UN Doc A/AC.105/C.2/L.272 [*Joint Statement*] (Reproduced in Appendix I).

contains provisions that are unique to the Moon Agreement and constitutes its real added value to the provisions of the other Outer Space Treaty.[4] The Joint Statement also underlines that the most discussed provision of the Moon Agreement is its article 11 related to space natural resources.

At the 50th session of the Legal Subcommittee of COPUOS held in 2011, several questions were raised by the Chair of one of its Working Groups in a questionnaire presented for discussion by delegates.[5] This questionnaire was presented in the context of a regular agenda item of the Subcommittee titled: "Status and Application of the Five United Nations Treaties on Outer Space." The questionnaire addressed three topics: (1) the Moon Agreement; (2) responsibility and liability in space law; and, (3) registration of space objects. Although the last two topics are traditionally discussed in this forum, the Moon Agreement is rarely addressed. Since there were no other agenda items having a direct link to this topic, the questionnaire was used as a means to put the topic on the table. It is significant to note that the Moon Agreement appeared first in the order of the questions:

1. Issues relating to the Moon Agreement, including possible points of consensus or of concern among States about the Agreement and its implementation
1.1 Do the provisions of the 1967 UN Outer Space Treaty constitute a sufficient legal framework for the use and the exploration of the Moon and other celestial bodies?
1.2 What are the benefits of being party to the 1979 UN Moon Agreement?
1.3 Which principles or provisions of the 1979 UN Moon Agreement should be clarified or amended in order to allow its wider adherence by States?

As analyzed further in this Chapter, although the questionnaire made no specific reference to the issue of space natural resources, it is the main reason why the Moon Agreement has not been ratified by the broad majority of states and also the reason why its implementation remains controversial. Consensus is required in order to have this topic set down as a new agenda item for consideration by the COPUOS Legal

[4] *Ibid*.
[5] United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS), Legal Sub-committee, *Set of Questions provided by the Chair of the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space*, UN Doc A/AC.105/C.2/2011/CRP.12 (Reproduced in Appendix II).

Subcommittee. While it is perceived by some delegations as a key topic for the future, the required consensus has not been achieved to pave the way for the issue of space natural resources exploitation to be tackled at the international level.

The first section of this chapter provides a global comparison between the Outer Space Treaty and the Moon Agreement. In the second section, the key legal provisions of the Moon Agreement are analyzed together with those of the Outer Space Treaty in order to establish their relevance as a governance framework for the future exploitation of space natural resources showing how the provisions of the Moon Agreement reinforce the principles of the Outer Space Treaty. The third and final section of this Chapter focuses on the provisions of the Moon Agreement that are of particular importance as compared to the corpus of existing space law. The overall objective is to evaluate whether the existing legal framework is adequate to govern the exploitation of space natural resources. This Chapter is supplemented by a comparative analysis table[6] highlighting the main provisions of the two treaties along with conclusions.

II. A GLOBAL COMPARISON BETWEEN THE OUTER SPACE TREATY AND THE MOON AGREEMENT

Among the major issues discussed in this study, there is the need to analyse the relevance of legal texts adopted a few decades ago at the height of the Cold War. Not only are today's space activities different from those that were conducted in the 1960's but we can foresee a major evolution regarding the type of activities to be carried out in space in the future and the actors who will be involved as described in the previous chapter. Does this mean that the legal framework needs to be rewritten? The objective of this section is not to undertake a detailed side-by-side analysis of all the provisions of the two treaties. Rather this section examines the main relevant provisions of the two treaties given the scope of this research and on the basis of the historical context, as well as the contemporary challenges in space in the 1960's (when the treaties were being negotiated) as compared to the currently prevailing context. The subject is addressed by way of a global comparative analysis between the two texts that emphasizes the different degree of support they have each received from the international community.

[6] See *infra* Appendix III.

1. DIFFERING DEGREES OF SUPPORT BY THE INTERNATIONAL COMMUNITY:

1.1 THE OUTER SPACE TREATY, WIDELY ACCEPTED BY THE INTERNATIONAL COMMUNITY

The Outer Space Treaty is considered as the *Magna Carta*[7] of international space law. Peyrefitte stresses that this Treaty gives to humanity the quality of subject of international public law as it creates new rights and obligations for States Parties.[8] The Treaty codifies the main legal principles regarding the conduct of space activities and the subsequent agreements[9] expand upon those rules with the introduction of more specific provisions. This is the case for the Moon Agreement as well as other existing space treaties and other relevant international agreements[10].

Compared to the Law of the Sea Convention where every effort was made to solve the problems in one single convention, the evolution of international space law has followed a step-by-step approach, addressing new problems as and when they arose. This is how the space treaties were negotiated after 1967, the Moon Agreement being the last significant space law achievement at treaty level. The Outer Space Treaty contains the general guiding principles, while the subsequent agreements are an extension of the basic principles. Based on the conceptual approach used by Bhatt in his 1968 article,[11] it could be said that the Outer Space Treaty meets "the optimum order demands," by setting out

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[7] Nandasiri Jasentuliyana, ed, *Space Law: Development and Scope*, (London/Westport CT: Greenwood, 1992) at 46 [*Jasentuliyana*]; Frans von der Dunk, "Outlook on space law for the next 30 years" in G Lafferranderie & D Crowther, eds, *Essays published for the 30th Anniversary of the Outer Space Treaty* (The Hague; Dordrecht; Cambridge MA: Kluwer Law International, 1997) at 404.

[8] See Léopold Peyrefitte, *Droit de l'espace* (Paris: Précis Dalloz, 1993) at 37 [*Peyrefitte*].

[9] The four subsequent treaties are: *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, 22 April 1968, 672 UNTS 119, 19 UST 7570, TIAS 6599 [*Rescue and Return Agreement*]; *Convention on International Liability for Damage Caused by Space Objects*, 29 March 1972, 961 UNTS 187, 24 UST 2389, TIAS 7762 [*Liability Convention*]; *Convention on the Registration of Objects Launched into Outer Space*, 12 November 1974, 1023 UNTS 15, 28 UST 695, TIAS 8480 [*Registration Convention*]; and the *Moon Agreement*, *supra* note 2.

[10] See eg, *Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting* GA Res 37/92, UNGAOR, 37th Sess, Supp No 51, UN Doc A/RES/37/92 (1982) [*Direct Broadcasting Principles*]; *Principles Relating to Remote Sensing of the Earth from Outer Space* GA Res 41/65, UNGAOR, 41st Sess, Supp No 53, UN Doc A/RES/41/65 (1986) [*Remote Sensing Principles*]; *Principles Relevant to the Use of Nuclear Power Sources in Outer Space* GA Res 47/68, UNGAOR, 47th Sess, Supp No 49, UN Doc A/RES/47/49 (1992) [*Nuclear Power Sources Principles*]; and, *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* GA Res 51/122 UNGAOR, 51st Sess, Supp No 49, UN Doc A/RES/51/122 (1996) [*Declaration on International Cooperation*].

[11] M Bhatt. "Legal Control of the Exploration and Use of the Moon and Celestial Bodies", (1968) 38 Indian J Int Sp L 8 [Bhatt].

basic legal principles aimed at ensuring: the maintenance of international peace and security;[12] that space activities are carried out for the benefits and in the interests of all countries;[13] and, that the Moon and other celestial bodies are used exclusively for peaceful purposes.[14] Some provisions are further elaborated upon in new international Agreements.[15] The Outer Space Treaty also codifies the principle of freedom of use and exploration of outer space, the Moon and Celestial Bodies; the principle of non-appropriation of outer space, and the principle that exploration and use shall be carried out for the benefit and in the interests of all countries, and that outer space shall be the province of all mankind.

1.2 THE MOON AGREEMENT, SUBJECT OF CONTROVERSY SINCE ITS ELABORATION

Prior to the adoption of the Moon Agreement, the US initiated the preparation of several reports on the Agreement. Among these are: (1) a report prepared by the Congressional Research Service (CRS)[16] which includes explanations on the legal provisions and the applicable law; (2) a report prepared by the Office of Technology Assessment[17] (a small scale assessment of the impact the agreement would have on the capability of the US to exploit extraterrestrial materials); and, (3) a report prepared by Eileen Galloway,[18] a recognized expert in the field. Although Galloway's report was neither approved nor disapproved by the Committee, its content is of precious relevance when trying to understand the rationale behind the adoption of the different provisions, as well as the lack of ratification of the Moon Agreement. In his letter of transmittal, the

[12] *Outer Space Treaty*, *supra* note 1 art III.
[13] *Ibid*, art I.
[14] *Ibid*, art IV.
[15] For example, the main rules governing astronauts are developed in a dedicated agreement – the *Rescue and Return Agreemen*t, *supra* note 9.
[16] "In 1914, Congress passed legislation to establish a separate department within the Library of Congress. President Woodrow Wilson signed the bill into law, and CRS, then called the Legislative Reference Service, was born to serve the legislative needs of the Congress. With the Legislative Reorganization Act of 1970, Congress renamed the agency the Congressional Research Service and significantly expanded its statutory obligations. The services provided today by CRS are a direct result of congressional directives and guidance." See online: Library of Congress <http://www.loc.gov/crsinfo/about/history.html>.
[17] The Office of Technology Assessment, which was closed in 1995, provided technical analyses for Congress. On the historical aspects of the Office of Technology Assessment, see online: Princeton <http://www.princeton.edu/~ota/ns20/cong_f.html> (date accessed: March 13, 2012).
[18] For the full text of the report, see US, Senate Committee on Commerce, Science and Transportation, 96th Cong, *Agreement governing the activities of States on the Moon and other celestial bodies* (Washington, DC: US Government Printing Office, 1980) [*Galloway Report*].

Chairman of the US Senate Committee on Commerce, Science and Transportation, Howard W. Cannon, stated that the Treaty:

> (…) would have a profound impact on how and when men first use these materials. This is particularly important to the United States because of the leadership it enjoys in the technology and use of outer space.[19]

After lengthy negotiations, the Moon Agreement[20] was adopted by consensus by the United Nations General Assembly on December 5, 1979 and opened for signature on December 18 that same year. This treaty remains one of the most controversial instruments of international space law. While it is often referred as the "Moon Agreement," it is an international treaty. As stated by Galloway: "All the documents are treaties, same binding force upon the contracting parties, whatever is their name." For several countries, due to national legal mechanisms, it required ratification.[21]

The Moon Agreement subsequently entered into force[22] but the lack of ratification by the major space faring nations since 1979 raises questions about its legal value. In 1980, three countries had signed the Agreement – Morocco, Austria and Chile – Peru in 1981.[23] It is important to note that since the release of the US vision for space exploration in January 2004, three additional countries have ratified the Moon Agreement (Belgium, Lebanon and Peru). As of January 1, 2011, there were 101 States Parties to the Outer Space Treaty, with an additional 26 States being signatory to it. There were 13 States Parties to the Moon Agreement, with an additional 24 States having only signed it. [24] All the space faring nations have ratified the Outer Space Treaty and it is broadly accepted and respected.

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[19] *Ibid*.
[20] *Moon Agreement*, *supra* note 2.
[21] In the US, the procedure required, if the text had been signed, that it be sent to the US Senate for advice and consent to ratification. The Senate Committee on Commerce, Science and Transportation has legislative jurisdiction over most civil space programs. See *Galloway Report*, *supra* note 18 at 2.
[22] *Moon Agreement*, *supra* note 2 art 19(3).
[23] For the status of signatures and ratifications of the Moon Agreement, see online: UN Office of Outer Space Affairs <http://www.unoosa.org/oosatdb/showTreatySignatures.do> (date accessed: March 13, 2012).
[24] *Report of the Legal Subcommittee on its fiftieth session, held in Vienna from 28 March to 8 April 2011* UN Doc A/AC.105/990, online: UNOOSA <http://www.unoosa.org/pdf/reports/ac105/AC105_990E.pdf>. (date accessed: March 13, 2012).

It is important to be aware of the context[25] in which the Moon Agreement was negotiated and to understand what happened at the time of the elaboration of the text. This helps to analyse the current challenges on space natural resources exploitation. The negotiations have often been misunderstood and sometimes this has led to misinterpretations.

2. HISTORICAL CONTEXT OF THE NEGOTIATIONS LEADING TO THE ADOPTION OF THE MOON AGREEMENT

The very first drafts of the Moon Agreement were elaborated at the same time the United Nations Convention on the Law of the Sea (UNCLOS) was being prepared. Ambassador Arvid Pardo of Malta proposed that the ocean's resources be the "common heritage of all mankind."[26] The first key players in the preparation of the text of the Moon Agreement were not space faring nations. In July 1970, Aldo Armando Cocca from Argentina introduced a proposal urging that: the natural resources of the Moon and other celestial bodies shall be the common heritage of all mankind; there should be a regime on the resources in space which should be distinct and separate from the regime that will govern resources brought back to Earth; and finally, that there was the need to ensure that the benefits obtained from the use of the resources be made available to all people without discrimination.[27] This proposal was followed by a letter sent by A. Gromyko, then Minister of Foreign Affairs of the USSR, to the Secretary General of the UN requesting that the UN General Assembly should commence work on a treaty related to the Moon. Galloway underlines that the text discussed in 1972 and 1973 is close to the one adopted in 1979. COPUOS Delegates were unable to agree on major issues such as: the scope of the treaty, whether the treaty should be applicable to the Moon only (as provided in the USSR draft of 1971) or also to celestial bodies (as proposed by the US in 1972), the type of information to be furnished on missions to the Moon and the provisions related to the exploitation of natural resources.[28]

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[25] On the historical context of the negotiations, see Eilene Galloway, "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies", (1980) V Ann Air & Sp L 481 [Galloway Article]
[26] *Galloway Report*, *supra* note 18 at 7
[27] *Ibid*.
[28] *Ibid* at 8.

At this stage, it is instructive to recall parts of the negotiations, notably statements made by Herbert Reis, the US Representative to the Legal Subcommittee of COPUOS, in May 1972:

> It seems right to state that such resources are part of the "common heritage of all mankind". This would parallel the policy proposed by President Nixon two years ago this month that all nations should regard the resources of the seabed lying beyond the point where the high seas reach a depth of 200 meters as the common heritage of mankind. On the other hand we would not want to preclude in any way the use of natural resources of celestial bodies for scientific investigation; US activities in returning lunar samples and in sharing them with scientific institutions around the world are well known, as are the Soviet Lunokhod returns and exchanges. We would also want to be careful to ensure that celestial body resources may be used where found for supporting life systems as for e.g. in uses by astronauts of liquids or gases of a particular celestial body. Finally, we would need to contemplate a special Treaty-drafting conference in the event of the discovery of commercially exploitable resources. At such conference participants would need to bear in mind not only common goals of economic advancement but the need to encourage investment and efficient development as well.[29]

The US position was extremely clear on both topics: common heritage of mankind and a regime to govern the exploitation of natural resources. As a consequence, in April 1972, the US delegation issued a Working Paper providing revisions to the Soviet draft. Consensus was reached the following month on 21 articles and the US text was adopted with the exception of a few topics that required further discussion, namely: scope of the Treaty (article I), provisions on resources (article X)[30] and liability issues (article XIII).

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[29] *Ibid* at 14.

[30] *Ibid* at 20, citing art X of the 1972 draft almost entirely in brackets because of the lack of consensus:
1. [The natural resources of the Moon [and other celestial bodies] shall be the common heritage of all mankind].
2. Neither States, international intergovernmental or non-governmental organizations, national organizations having the status of juridical persons or not, nor natural persons, may claim the surface or subsurface of the Moon [or celestial bodies] as their property. The placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface of the Moon [or celestial bodies] including structures connected with its [their] surface of subsurface, shall not create a right of ownership over parts of the surface or subsurface of the Moon [or other celestial bodies].
3. [Parts of the surface or subsurface of the Moon [or other celestial bodies] may not be the object of grant, exchange, transfer, sale or purchase, lease, hire, gift or any other arrangement or transactions with or without compensation between States, international intergovernmental and non-governmental organizations or national organizations having the status of juridical persons or not, or of arrangements or transactions between natural persons].
4. [The States Parties to this Treaty, bearing in mind the need for economic advancement and for the encouragement of investment and efficient development if utilization of the resources of the Moon and other celestial bodies becomes a reality, recognize the importance of concluding agreements in this area. To

Several proposals were made in 1973. With the support of other delegations, India proposed that the natural resources should be declared the common heritage of mankind, but the USSR vehemently opposed any such suggestion until 1979. India also proposed a moratorium on the resources until an international regime has been set up, but the US expressed opposition to this proposal. This was followed by a debate initiated by USSR regarding the notion of property rights, during which it was claimed that outer space and celestial bodies are the province of mankind, available for the undivided and common use of all States on Earth, but jointly owned by them. The USSR delegation argued that the concept of common heritage of all mankind is linked to the recognition of inheritance and the right to succession while the Moon and celestial bodies are not subject to civil law. The USSR delegation considered that the recognition of inheritance and the right to succession is bound up with the concept of property and property rights. For the USSR, the surface and subsurface of the Moon cannot be the objects of civil law, and cannot be the object of succession as it belongs to nobody.[31]

Argentina strongly defended the notion of common heritage of mankind in a Working Paper supporting a distinction between ownership and beneficial ownership which includes enjoyment, receipt of fruits or profit.

> There undoubtedly exists on the moon beneficial ownership pertaining to its utilization and to the possible exploitation of its natural resources. The major merit of replacing the vague expression "province of all mankind" by the more meaningful expression "common heritage of all mankind" is that in so doing one has specified the commencement of an action, replacing an abstract statement by a means of operating, within a specified legal framework. The fact that General Assembly resolution 2749 (XXV) on the sea-bed was adopted without any dissenting vote is definite proof of the existence of this legal viewpoint common to all States, entirely irrespective of their special internal features, their philosophical ideas or their policies." [32]

Up until the end of the negotiations, the USSR consistently objected to the principle of the common heritage of all mankind despite the position of a large number of

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this end, the Depository Government shall promptly convene a meeting of all States Parties with a view to negotiating arrangements for the international sharing of the benefits of such utilization when one third of the States Parties inform the Depository Government that they consider that practical utilization of the resources of the Moon or other celestial bodies is likely to begin within two years following or has already begun].

[31] *Ibid* at 27-28.

[32] *Galloway Report*, *ibid* at 29-31.

countries in favour of the concept. The USSR was also supportive of the proposal that the status of natural resources be addressed in a separate legal instrument in the form of an additional protocol.[33]

Between 1973 and 1979, the delegations tried to resolve issues of disagreement and lack of consensus. At that time, the main questions discussed were the scope of the treaty and information to be furnished on missions to the Moon as well as issues related to natural resources and the notion of the Moon and Celestial bodies being the Common Heritage of Mankind. In 1974, the Working Group decided to focus on the natural resources as the belief at the time was that a solution to this issue would help resolve the remainder of the outstanding issues. The elaboration of UNCLOS was also another element that encouraged delegates to come to a final solution on space matters. Ambassador Cocca raised the fact that since COPUOS had created the concept of common heritage of mankind - the Committee was referred as the "pioneer in this matter, the body which elaborated the concept of the common heritage of mankind"[34] - there was a need to finalise the agreement before the Law of the Sea Convention was finalized.

Between 1976 and 1978, the drafting of the Moon Agreement was the priority of the Legal Subcommittee and several papers were submitted with the intention of finding a suitable solution for all. The USSR began to change its position on the matter.[35] At the end of the negotiations in 1979, delegations were frustrated and worried about not being able to reach consensus, and there was a high risk that the Moon Agreement would lose priority on the agenda of the Legal Subcommittee of COPUOS and even be entirely removed from it. Several delegations expressed opinions on the matter: the German

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[33] *Galloway Report*, *ibid* at 32. This was a statement made on June 28, 1977 by Mr Maiorski the USSR delegate.

[34] *Galloway Report*, *ibid* at 34-35. On 25 June 1976, Ambassador Cocca stated: "the conference on the Law of the Sea will be convening one month after we conclude our deliberations. It would be right if a consensus is reached….. that it should be our Committee, the pioneer in this matter, the body which elaborated the concept of the 'common heritage of mankind' and which incorporated it in the first text of an international instrument known to the UN, that develops this concept."

[35] *Galloway Report*, *ibid* at 37. The USSR made a statement recalling its doubts about the common heritage of mankind principle and international regime and adding: "we were very close to the completion of that work, and my delegation is, in principle, not a bad basis for a compromise solution of this question. But, like a number of other delegations, we too think that this text does need further study by our competent bodies."

Democratic Republic, Australia and France,[36] in particular, mentioned that the topic was no longer a priority and expressed a desire to abandon it. On the other hand, other countries notably Venezuela, Yugoslavia, India and the US were ready to continue the efforts.

An informal Working Group of the Committee was established and met four times between June 26 and July 3, 1979. Through the work of this smaller group, agreement was reached on all the outstanding issues as follows:

- the scope of the Agreement should include "Other celestial bodies"[37] and additional legal norms on the celestial bodies should be created in the future
- The document would be titled as an agreement and not a treaty, keeping the word treaty for the Outer Space Treaty
- On the type of information to be furnished: States shall to the greatest extent feasible and practicable inform the public and the international community of their activities concerning the use and exploration of the Moon (most of the detailed provisions were made by the US in 1972, the major difference being that the US recommended that information be given "well in advance of launching")
- Natural resources: agreement on the basis of the text developed from article 11 of the 1972 US proposal.

Galloway[38] identifies three distinct phases of the historical context of the international negotiations: A first phase of active exploration activities and the elaboration of first proposals with the objective of maintaining the Moon for peaceful purposes; in the second phase, ideas emerged from developing countries expressing concern about the natural resources. At the end of the negotiation process, in a third phase, between 1977 and 1979, delegations were dissatisfied because they could not reach consensus on other major space law issues on the agenda (e.g., television broadcasting and remote-sensing principles). Activities on natural resources were considered as expensive and futuristic. For Galloway, there was a temptation to "favour relegation of the draft Moon Treaty text to a lower status, eliminate it from the agenda or achieve a

[36] *Galloway Report*, *ibid* at 40. Mr Richer the French delegate stated that "the French delegation will spare no effort if other delegations deem it useful to resume discussion on it. We feel that this is a political problem, which must be settled in political terms and perhaps in a larger body than the one to which it is at present limited."

[37] A few years later, Diederiks-Verschoor stressed the absence of a legal definition for "celestial bodies". See IHPh Diederiks-Verschoor, *An introduction to space law*, 2d rev ed, (Alphen aan den Rijn: Kluwer, 1999) at 50 [*Diederiks-Verschoor*].

[38] Galloway Article, *supra* note 25 at 481-499.

consensus and go forward with an agreement." Eventually, a spirit of compromise prevailed and the text was adopted by consensus although, following the proposal first made by Argentina in 1970, an extensive discussion had taken place on the concept of Common Heritage of Mankind.[39]

Since some countries wished to introduce further modifications to the draft text as agreed upon, a decision was taken to adopt understandings which would have to be taken into account when interpreting relevant provisions. They are related to articles 1(1), 1(2) and 7. These understandings are discussed in detail below. The COPUOS draft text was referred to the United Nations Special Political Committee. This text was adopted without a vote on November 2, 1979 in New York, and was opened for signature on December 18 that same year.

There is an important difference between the Moon Agreement and the Outer Space Treaty. In this connection, Stanley Rosenfield is of the opinion that "the Moon Agreement would provide severe limitations over those provided by the 1967 Outer space Treaty" (referring to the notion of the Common Heritage of Mankind and the international regime on space natural resources).[40] As demonstrated below, however, this opinion is extremely restrictive. The Moon Agreement contains important provisions of great interest for a future regime. The word "limitation" therefore does not reflect the reality of the situation. At the time of the Cold War, the discussions around the Moon Agreement generated tensions between the US and USSR notably on the question of resource exploitation. Driven by concerns of safety, cooperation and avoidance of interference, the US wanted the Moon Agreement to include provisions requiring states to provide the maximum amount of information about their activities on the Moon.[41] An interesting aspect of the Moon agreement underlined by Peyrefitte is the fact that this Agreement gave the Third World an opportunity to be heard in the elaboration of space law.[42] As underlined by Jakhu, the international space regime – to which belong those two treaties – has a universal application.

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[39] About the Common Heritage of Mankind, see *infra* Chapter III.
[40] Stanley Rosenfield, "Article XI of the Draft Moon Agreement" in *Proceedings of the 22nd Colloquium on the Law of Outer Space* (Herndon VA: AIAA/IISL, 1979) 209 [Rosenfield, Article XI of the Draft Moon Agreement].
[41] See *Diederiks-Verschoor*, *supra* note 37 at 53.
[42] See *infra* note 8 paragraph 101 p 39.

> [...] the principle of global public interest in outer space [...] has guaranteed an equal right of access to outer space for all States without discrimination of any kind. The predominant nature of this principle also implies that exploration and use of outer space must be in some way beneficial to the whole of humanity and in the maintenance of international peace and security.[43]

In this regard, the framework that will govern the exploitation of space natural resources will need to take into account this global public interest and the interest of all countries as a whole.

The adoption of the existing framework of international space law was achieved on the basis of the consensus mechanism originally developed in the frame of COPUOS.[44] However, it is true that for several decades now, the consensus mechanism has become an obstacle to achieving international agreement in space matters. Considering the large number of countries, and the desire of some of them not to be bound by international law on specific topics, no major development in international space law has occurred. The next section aims at demonstrating the relevance of the provisions of the Outer Space Treaty and the Moon Agreement to the exploitation of space natural resources.

III. THE MOON AGREEMENT REINFORCES THE PRINCIPLES OF THE OUTER SPACE TREATY

This section will analyze the provisions of the 1967 Outer Space Treaty and the 1979 Moon Agreement in order to draw a picture of the current legal regime applicable to the exploitation of space natural resources, highlighting the consequences of the different provisions for the actors. In some cases, new wording, when needed, will be proposed. The following elements are studied: (1) scope of the agreement; (2) peaceful purpose and related provisions; (3) benefit clause; (4) freedom of exploration and use; (5) freedom of scientific investigation; (6) non-contamination; (7) States responsibility and liability; (8) cooperation and mutual assistance; (9) respect of international law; (10) settlement of disputes; and, (11) obligation of information.

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[43] Ram Jakhu, "Legal Issues relating to the global public interest in outer space" (2006) 32 J Sp L 55 [Jakhu].

[44] "A consensus takes time, the results provides a firm basis of support for any agreement. Success in using this method of decision making depends upon the objectivity and sensitivity of the chairman, combined with a will for agreement among the members of the group. COPUOS used this method successfully in negotiating five space treaties between 1966 and 1979." See *Galloway Report*, *supra* note 18.

1. THE SCOPE OF THE MOON AGREEMENT

As noted in the previous section, from the very inception, the scope of the Moon Agreement was a matter of controversy during the treaty negotiations. The scope of the Outer Space Treaty is outer space, including the Moon and other celestial bodies. The Moon Agreement is applicable to the Moon as well as other celestial bodies, except the Earth. Separate agreements may be concluded for any celestial body.[45] Article 1(2) of the Moon Agreement mentions that "[f]or the purpose of this Agreement reference to the Moon shall include orbits around or other trajectories to or around it." Among the understandings adopted to clarify the Agreement, one is related to article 1: "The trajectories and orbits mentioned in art 1(2) do not include trajectories and orbits of space objects between the Earth and such orbits".[46] Based on art 1(3), the Agreement does not apply to extraterrestrial materials that reach the surface of the Earth by natural means. The Moon Agreement therefore does not apply to meteorites that reach the Earth's surface.

On the basis of the scope of the Moon Agreement as described in this article, when dealing with space natural resources, the provisions of the Moon Agreement are applicable to the natural resources located on the Moon and on other celestial bodies within the solar system, as well as orbits around or other trajectories around the Moon. The only exception is the extraterrestrial materials which reach the surface of the Earth by natural means. Although an exhaustive knowledge about the resources does not exist, the scope of the Moon Agreement is very broad as it deals with the natural resources of the entire Solar system. Despite the provision of art 1(1), no other specific legal norms have been elaborated with respect to any of these celestial bodies. As far as space resources are concerned, there will probably be a need for additional norms in the future. In the meantime, a minimum set of rules is needed on the exploitation of space natural resources. Future norms could be built on the basis of future knowledge about the celestial bodies and regulatory needs.

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[45] *Moon Agreement*, *supra* note 2 art I(1).
[46] *Galloway Report*, *supra* note 18 at 42. This understanding is stated at paragraph 63 of the Committee report.

2. PEACEFUL PURPOSES, THE CORNERSTONE OF INTERNATIONAL SPACE LAW

During the negotiation of the Moon Agreement, the US delegation was in favour of the peaceful purposes principle. In the words of Mr. Kramer, then Assistant Secretary of Defense for International Security Affairs at the US Department of Defense:

> US security interests could be enhanced by the acceptance by other nations through their ratification of the Agreement, from its arms control provisions and other provisions which would limit certain military activity.[47]

Article IV(2) of the Outer Space Treaty states: "The Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes." This provision is the cornerstone of space law. In the establishment of COPUOS in 1959, Resolution 1472 (XIV) titled "international co-operation in the use of outer space," recognized in its preamble "the common interest of mankind as a whole in furthering the peaceful use of outer space." This principle has guided all space activities since the first satellites were launched. Since the end of the Cold War, there have been ongoing debate, sometimes within very high political circles about the use of Earth or even space infrastructure for aggressive actions. The scope of article IV of the Outer Space Treaty is, however, limited and this conclusion is supported by the fact that the provisions of the Outer Space Treaty do not include an outright ban on arms in space. This is because, not all types of weapons are addressed in the Treaty (e.g., the text specifically mentions nuclear weapons and weapons of mass destruction, but not other types of weapons), neither are all areas of outer space addressed. A literal interpretation of the provisions of the Outer Space Treaty therefore supports the foregoing conclusion. However, it is also clear that this literal reading of the provisions is inconsistent with the spirit of the Outer Space Treaty.

Article 3 of the Moon Agreement contains a mirror provision on the principle of peaceful purposes.[48] However, in its article 3(2), the Moon Agreement adds an element of protection that cannot be found in the Outer Space Treaty: "Any threat or use of force or

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[47] Jakhu, *supra* note 43 at 244.

[48] *Moon Agreement*, *supra* note 2 art III:

1. The moon shall be used by all States Parties exclusively for peaceful purposes.

2. Any threat or use of force or any other hostile act or threat of hostile act on the moon is prohibited. It is likewise prohibited to use the moon in order to commit any such act or to engage in any such threat in relation to the earth, the moon, spacecraft, the personnel of spacecraft or man- made space objects.

any other hostile act or threat of hostile act on the [M]oon is prohibited. It is likewise prohibited to use the [M]oon in order to commit any such act or to engage in any such threat in relation to the [E]arth, the [M]oon, spacecraft, the personnel of spacecraft or man-made space objects." The objective of the drafters was clearly to reinforce the peaceful purposes principle in relation to the conduct of activities on the Moon, considering the Moon exploration programmes of the time. The Moon Agreement goes further than the 1967 Treaty: it is more explicit and states a real prohibition. According to Jakhu, "article 3(2) of the Moon Agreement is certainly a significant improvement over the regime established under the 1967 Outer Space Treaty as the Moon Agreement considerably enhances conditions for exclusively peaceful exploration and exploitation of the Moon, an important pre-requisite for encouraging exploration and use of the natural resources of the Moon".[49] At the time of adoption of the Moon Agreement, France made a clarification: the provisions of art 3(2) relating to the use or threat of force cannot be construed as anything other than a reaffirmation, for the purpose of the field of endeavour covered by the Agreement, of the principle of the prohibition of the threat or use of force, which States are obliged to observe in their international relations, as set forth in the UN Charter.

The peaceful purposes principle is relevant to the exploitation of space natural resources. Any hostile act or threat thereof directed to a spacecraft, or the personnel on board would be detrimental to exploitation activities by delaying the plan and/or interrupting the project; by generating extra cost and jeopardizing the investments made. The difficult context of the negotiations that preceded the adoption of the Moon Agreement provided the rationale for the drafters to add the provision, underlying the fact that the US and USSR were both concerned about the potential future activities to be conducted on the Moon. Exploitation of the resources was probably not the first concern, but rather the use for military means. Both the Outer Space Treaty and the Moon Agreement deal with military activities, with article 3(4) of the Moon Agreement being almost a repetition of art IV(2) of the Outer Space Treaty.[50] Parallel provisions also

[49] Jakhu, *supra* note 43.

[50] *Moon Agreement*, *supra* note 2 art III(4): The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on the moon shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall

address nuclear activity.[51] These are mirror provisions with the provisions of the Moon Agreement being a bit more detailed in scope.

The next paragraphs will show that potential military use of space has not disappeared from the agenda of the space powers. In this regard, with an increasing trend of commercial space activities and new countries involved, peaceful use of space remains a fundamental principle that affects the exploitation of space natural resources. A few recent developments in this direction deserve to be mentioned. Space infrastructure can become a target either from the Earth or in space with the use of anti-satellite (ASAT) weapons. An attack on space infrastructure can have a tremendous impact on a country's economy. International security would also be compromised. On 11 January 2007, China destroyed one of its own weather satellites with a ballistic missile thereby generating a large cloud of debris in Low Earth Orbit and also causing a lot of concern regarding the capability of the country to succeed in targeting possible US space assets.[52] This was also an occasion for China to demonstrate its power and influence in the Asian region. This event was over-analyzed as being a pure act vis-à-vis the US. In February 2008, a US navy cruiser hit an American spy satellite (USA 193) under the pretext that the satellite had active fuel and therefore posed a significant risk of causing harm on Earth.[53] Why are the above developments linked to the present study?

At the plenary meeting of the Conference on Disarmament held on 12 February 2008, a draft Treaty on Prevention of the Placement of Weapons in Outer Space and of

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not be prohibited. The use of any equipment or facility necessary for peaceful exploration and use of the moon shall also not be prohibited.

See *Outer Space Treaty*, *supra* note 1 art IV(2): The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited.

[51] *Outer Space Treaty*, *supra* note 1 art IV(1): States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner. C.f. *Moon Agreement*, *supra* note 2 art 3(3): States Parties shall not place in orbit around or other trajectory to or around the Moon objects carrying nuclear weapons or any other kinds of weapons of mass destruction or place or use such weapons on or in the Moon.

[52] Shirley Kan, *China's Anti-Satellite Weapon Test of 23 April 2007* (CRS report for Congress) online: <http://www.fas.org/sgp/crs/row/RS22652.pdf> (date accessed: March 13, 2012).

[53] "New Wikileaks Docs Reveal Ongoing Satellite Battles Between US and China" online: FieldLogix <http://www.fieldtechnologies.com/new-wikileaks-docs-reveal-ongoing-satellite-battles-between-us-and-china/> (date accessed: March 13, 2012).

the Threat or Use of Force against Outer Space Objects (PPWT) was jointly introduced by Russia and China.[54] The 2008 draft was rejected by the US. Further negotiations have not succeeded as yet but it is obvious that today, the subject is one of the most important topics on the international agenda. Such text could provide some security in the future development of space activities – civil, military, scientific and commercial. In the absence of a separate dedicated agreement on the non-peaceful use of space, the provisions of the existing international space law treaties related to peaceful purposes maintain their importance, force and effect. Considering the relevance of the topic, this subject could require a dedicated agreement that secures its application to all areas of outer space, including the Moon and celestial bodies.[55]

Why does the exploitation of space natural resources require the peaceful use principle to be respected? As examined below,[56] exploitation of space natural resources was foreseen but only in the limited context of being used to support the practical aspects of space missions. Exploitation exists in space on intangible resources as already mentioned.[57] Irrespective of the international area in which exploitation of natural resources occurs, it can easily generate tensions. The peaceful use obligation is an element of stability in international relations. The main difficulty is that what is prohibited is not mentioned. As stated in the 2008 Joint Statement presented at the COPUOS Legal Subcommittee, article 3 of the Moon Agreement "contributes to preventing the development, placement and use of armament systems and weapons in or

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[54] The draft was jointly prepared by Russia and China. See Victor Vasiliev, "Draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects" online: United Nations Institute for Disarmament Research (UNIDIR) <http://www.unidir.org/pdf/articles/pdf-art2822.pdf> (date accessed: March 13, 2012). See also "Russia, China propose new treaty to ban arms in space" *The Indian Express* (February 13 2008) online: The Indian Express <http://www.indianexpress.com/news/russia-china-propose-new-Treaty-to-ban-arms/272272/>; Walter Pincus, "Fine Print: U.N. Hopes to Ban New Fissionable Material, Space-Based Weapons" *The Washington Post* (June 2 2009) online: The Washington Post <http://www.washingtonpost.com/wp-dyn/content/article/2009/06/01/AR2009060103668.html> (date accessed: March 13, 2012). Previous drafts had been prepared by China and Russia together in 2002. Art II of the Draft states that States Parties undertake not to place in orbit around the Earth any objects carrying any kind of weapons, not to install such weapons on celestial bodies, and not to station such weapons in outer space in any other manner; not to resort to the threat or use of force against outer space objects; not to assist or encourage other states, groups of states or international organizations to participate in activities prohibited by the Treaty.

[55] This would certainly be a challenging topic for a dedicated thesis.

[56] See *infra* Chapter IV.

[57] See *supra* Chapter I .

from outer space."[58] Should the provisions of the Moon Agreement not be applicable, the Outer Space Treaty remains fully relevant. The wording of the Moon Agreement should preferentially apply to the exploitation of space natural resources as it goes further by adding new obligations. Provisions related to military activities also need to be kept intrinsically linked to the peaceful use principle.

3. SUBJECT TO ADAPTATION, THE BENEFIT CLAUSE IS REQUIRED FOR THE FUTURE FRAMEWORK ON THE EXPLOITATION OF RESOURCES

Article I of the Outer Space Treaty provides that: "the exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind."[59] Article 4 of the Moon Agreement repeats article I(1) of the Outer Space Treaty and adds the following sentence: "Due regard shall be paid to the interests of present and future generations as well as to the need to promote higher standards of living and conditions of economic and social progress and development in accordance with the Charter of the United Nations."[60] The second paragraph goes even further to reinforce the provisions on international cooperation and mutual assistance.[61]

3.1 A TYPICAL PRINCIPLE OF INTERNATIONAL SPACE LAW - THE SUBJECT OF EXTENSIVE DISCUSSION

Known as the "benefit clause", article I(1) of the Outer Space Treaty is one of the key provisions of the Outer Space Treaty. Its goal is to promote international co-operation between all States. It is based on the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer space (1962),[62] which provides that "[t]he exploration and use of outer space shall be carried on for the benefit and in the

[58] See *Joint Statement*, *supra* note 3 at 5.
[59] See *Outer Space Treaty*, *supra* note 1 art I.
[60] *Moon Agreement*, *supra* note 2 art 4(1): The exploration and use of the Moon shall be the province of all mankind and shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development. Due regard shall be paid to the interests of present and future generations as well as to the need to promote higher standards of living and conditions of economic and social progress and development in accordance with the Charter of the United Nations.
[61] See *infra* under III.
[62] *Direct Broadcasting Principles, supra* note 10.

interests of all mankind."[63] Article I(1) has been widely discussed by various authors on issues related to existing space activities as well as on the impact it may have on future activities. Its impact on the possibility of exploiting space natural resources has been the object of numerous articles since it raises critical issues.[64] It bears one of the typical characteristics of the COPUOS legal provisions that were adopted in the 1960's: it emphasizes the intention of ensuring that exploration and use of outer space will be for the benefit and in the interests of all countries without specifying the modalities. It is necessary at this stage to look at the historical context of the benefit clause before addressing its impact on the exploitation of space natural resources.

3.2 HISTORICAL CONTEXT OF THE BENEFIT CLAUSE

During the negotiation of the Outer Space Treaty, the US was questioned whether States Parties thereto could be required to make available their communication satellites, including defence communications satellites to other countries on the basis of article I. In response, Ambassador Goldberg replied that article I is a statement of general goals, and that separate international agreements would be required to cover the use of particular satellites.[65] This position was shared by the USSR. The French representative expressed the following opinion on the matter:

> There is a need to consider the legal significance of the unified text and its variants and to make it reflect the concerns of those countries which looked forward to sharing, not necessarily in the exploration and use of outer space and celestial bodies, but at any rate in the results of those activities. [...] It could be done by establishing very general principles which, on the one hand, would grant States and international organizations the widest possible facilities to engage in useful space activities and, on the other hand, would assure other States that their vital interests would not be jeopardized and that they would share to the fullest possible extent, under equitable conditions, in the benefits derived from those activities.[66]

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[63] *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, GA Res 1962(XVIII), UNGAOR, 18th Sess, Supp No 15, UN Doc. A/RES/18/1962 [*Declaration of Legal Principles*].
[64] See "views expressed by authors on the benefit clause" *infra* under III.
[65] Hearings on Executive D, before the Senate Committee on Foreign Relations, 90th Cong., Ist Session, "Treaty on Outer Space" at 31-37, 12 April 1967.
[66] UNCOPUOS, Legal Sub-Committee, Fifth Session, *Summary Record of the 69th Meeting*, UN Doc A/AC.105/C.2/SR.69 at 5-6 [*Summary Record of the 69th Meeting of the Fifth Session of UNCOPUOS Legal Sub-Committee*].

The drive to negotiate further international agreements on the issue of benefits failed.

In 1977, a group of developing countries made an attempt to have the benefit clause further elaborated. They introduced a working paper on international cooperation raising the whole question of space benefits. They suggested that treaty provisions should be drafted to define the right of access to a share in the benefits of space activities. Developed countries are very sensitive to the question of sharing of benefits from space exploration and use. As a consequence, the process of achieving consensus among member states of COPUOS was slow and difficult. It was only ten years later that a new COPUOS agenda item on the suggestion was adopted. The new agenda item was titled: "Consideration of the legal aspects related to the application of the principle that the exploration and utilization of outer space shall be carried out for the benefit and in the interests of all States, taking into account the needs of developing countries." Introduced in 1988, the discussions that ensued did not lead to any concrete results. Some countries could not even accept the idea of the creation of a working group, which would have opened the door to real discussion.

Gabriel Lafferranderie has noted with humour that "the longer the text of an agenda item is, the more controversy it surely contains". He also underlined the fact that industrialized countries used this expression to support their views at the Legal Subcommittee but never agreed to prepare a draft.[67] Commenting on the issue, Jasentuliyana[68] stressed how delicate this issue was for the developed countries. The new agenda item that was finally introduced addressed a larger subject to avoid having to deal directly with the international cooperation and benefit sharing issue. The output was a simple *note verbale* sent to delegations in 1989 asking for their views on international

[67] Marietta Benkö and Kai-Uwe Schrogl, "Article I of the Outer Space Treaty reconsidered after 30 years 'Free use of outer space' v 'space benefits'" in G Lafferranderie, D Crowther, eds, *Outlook on space law for the next 30 years - Essays published for the 30th Anniversary of the Outer Space Treaty* (The Hague; Dordrecht; Cambridge MA: Kluwer, 1997) at 71 [Benkö & Schrogl].

[68] For Jasentuliyana, "by calling attention to the essential needs of mankind and emphasizing the importance of co-operation, the objective was to require States to co-operate internationally in their space ventures. The extent of obligation involved is not clear." See N Jasentuliyana, "Review of recent discussions relating to aspects of article I of the Outer Space Treaty" in *Proceedings of the 32nd Colloquium on the Law of Outer Space*, (Herndon, VA: AIAA/IISL, 1989) [Jasentuliyana, Review].

agreements relevant to the subject under review. A working group on the issue was eventually established in 1991.

The wording of article I(1) of the Outer Space Treaty raises two limitations, namely: "for the benefit" and "in the interests" of all countries. While developing countries were asking for some codification, the rationale behind this initiative was rather political: to obtain a higher level of cooperation with developed countries in order to reduce the technological gap. For Jasentuliyana, despite the fact that a legal regime was not realistic, there were ways to improve the dialogue.[69] The concerns of the countries have remained despite further elaboration of space law. The sharing of the benefits is still an open question today.

In the telecommunications domain, for example, the benefit sharing issue necessitated the adoption of legal provisions from the very beginning. The international legal regime of the ITU implements the benefit sharing principle by providing for an equitable distribution of radio frequencies: the ITU Constitution stipulates that "[i]n using frequency bands for radio services, Members shall bear in mind that radio frequencies and the geostationary-satellite orbit are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries."[70]

Since international cooperation alone is not sufficient to ensure that developing countries are able to share in the benefits gained from space activities as provided for in article I of the Outer Space Treaty, their approach was to request the elaboration and adoption of further legal provisions. Following the elaboration of the five main space treaties and the various UN principles relevant to space activities, the adoption of binding international agreements became increasingly difficult. Even today, developing countries would rather continue to work on the basis of the existing legal texts that represent

[69] Taking the example of the United Nations Remote Sensing Principles, Jasentuliyana suggests preparing a series of narrow agreements and converting them in binding agreements. This interesting approach will be reviewed later in this research, as part of the potential regime changes. See *ibid*.
[70] ITU Convention, art 44, online: <http://www.itu.int/net/about/basic-texts/constitution/chaptervii.aspx> (date accessed: June 25, 2012).

important compromises. Remote Sensing, for example, was a highly sensitive issue and UN Remote Sensing principles[71] contain the right of access of a sensed State to raw data but not more. Such data must be provided to the sensed state on a non-discriminatory and reasonable cost basis.[72]

The results of space activities are shared most of the time. This is particularly the case with respect to scientific results, which are communicated to the whole scientific community, even beyond the program partners. A distinction can be made between: scientific space activities, the results of which are usually well shared; commercial activities in space requiring a significant upfront financial investment; and, defence activities, the results of which are usually not shared due to national and international security considerations. It is clear that developing countries may get the benefit from scientific space activities but not from the other types of activities.

3.3 VIEWS EXPRESSED BY AUTHORS ON THE BENEFIT CLAUSE

The benefit clause is considered by some authors as a limitation upon the term "use" also appearing in article I(1) of the Outer Space Treaty. Its content is considered as being vague.[73] For Hobe, articles I(1) and II (on non-appropriation)[74] are two limitations upon freedom of economic exploitation. In the opinion of Brooke, the benefit clause should rather be considered as a general principle and, as such, its impact may be minimized.[75] Brooke's opinion seems to be the preferred view. In fact, those provisions never prevented the development of international space law. Writing in 1989, Jasentuliyana described article I as a key provision for the maintenance of relations between developed and developing countries, the latter asking for the establishment of an

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[71] *Remote Sensing Principles*, *supra* note 10.
[72] Art XII of the *Remote Sensing Principles*, *ibid* states that: "As soon as the primary data and the processed data concerning the territory under its jurisdiction are produced, the sensed State shall have access to them on a non-discriminatory basis and on reasonable cost terms. The sensed State shall also have access to the available analysed information concerning the territory under its jurisdiction in the possession of any State participating in remote sensing activities on the same basis and terms, particular regard being given to the needs and interests of the developing countries."
[73] Stephan Hobe, "Adequacy of the Current Legal and Regulatory Framework Relating to the Extraction and Appropriation of Natural Resources in Outer Space" (1995) XX Ann Air & Sp L 115 [Hobe].
[74] See *infra* under IV.
[75] Eugene Brooke, "Control and Use of Planetary Resources" in *Proceedings of the 11th Colloquium on the Law of Outer Space* (Herndon, VA: AIAA/IISL, 1968) 339 [Brooke].

international regime on the sharing of information in order to detail the benefits derived from space activities. For Jasentuliyana:[76]

> States' obligations towards international space co-operation under Article I of the Outer Space Treaty are difficult to enforce and constitute more a moral and philosophical obligation than a legal requirement. [...] it will primarily serve the developing countries as a vehicle to draw attention to their concerns and to appeal to the moral consciousness of those States with substantive space activities to co-operate as much as possible with them.

It is clear that we cannot deduce from the benefit clause an obligation to equally share all the benefits gained from space activities. It is also true that we are dealing here with a general principle. The main outcome of the lengthy debates at COPUOS was the adoption in 1996 of 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.[77] The Declaration contains the following provision: "All States, particularly those with relevant space capabilities and with programmes for the exploration and use of outer space, should contribute to promoting and fostering international cooperation on an equitable and mutually acceptable basis".[78] In a 1997 article dedicated to the benefit clause, Marietta Benkö and Kai-Uwe Schrogl concluded that the Declaration should have three broad impacts: first it should prevent future confrontation at the general political level between the North and the South which focused on the introduction of forced cooperation and transfer of resources, now that the Declaration provides an authoritative interpretation of the cooperation principle. Secondly, space powers should foster international cooperation on an equitable and mutually acceptable basis. Finally, the decision was taken by COPUOS to hold the UNISPACE III Conference.[79]

While the 1996 Declaration remains a great achievement, from a legal perspective it did not really bring about any significant progress in the sharing of benefits gained from space activities.

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[76] Jasentuliyana, Review, *supra* note 68.
[77] See *Declaration on International Cooperation*, *supra* note 10.
[78] *Ibid*, Annex, art 3.
[79] See Benkö & Schrogl, *supra* note 67 at 76.

3.4 WHAT THE BENEFITS SHARING PROVISIONS OF THE EXISTING REGIME IMPLY FOR THE STUDY

The benefit clause of the Outer Space Treaty remains a fundamental pillar of space law and has not prevented the commercial space sector from growing. Compared to the benefit clause contained in the Moon Agreement, it is obvious that the latter Agreement elaborates the benefit clause much further. However, in either case, the benefit clause is still a statement of general goals.[80] A proper regime on the exploitation of space natural resources requires moving beyond the statement of general goals and establishing global principles as well as more detailed measures depending on the nature of the resources concerned.

4. A MORE ELABORATE FREEDOM OF EXPLORATION AND USE PRINCIPLE

A fundamental principle of space law finds expression in the freedom of exploration and use of outer space. While this principle is explicitly captured in article I of the Outer Space Treaty, there are other important provisions elsewhere in the Outer Space Treaty as well as in the Moon Agreement that reflect the existence and importance of the principle. Article I(2) of the Outer Space Treaty provides that "outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be freedom of access to all areas of celestial bodies." The principle of freedom as expressed in article 8 of the Moon Agreement[81] is more specific as it provides that "States Parties may pursue their activities in the exploration and use of the Moon anywhere on or below its surface." Article 8 of the Moon Agreement goes on to provide examples of what is allowed. Thus, States Parties to the Moon Agreement may: "(a) land their space objects on the Moon and launch them from the

[80] *Supra* note 65.

[81] *Moon Agreement*, *supra* note 2 art 8: 1. States Parties may pursue their activities in the exploration and use of the Moon anywhere on or below its surface, subject to the provisions of this Agreement. 2. For these purposes States Parties may, in particular: (*a*) Land their space objects on the Moon and launch them from the Moon; (*b*) Place their personnel, space vehicles, equipment, facilities, stations and installations anywhere on or below the surface of the Moon. Personnel, space vehicles, equipment, facilities, stations and installations may move or be moved freely over or below the surface of the Moon. 3. Activities of States Parties in accordance with paragraphs 1 and 2 of this article shall not interfere with the activities of other States Parties on the Moon. Where such interference may occur, the States Parties concerned shall undertake consultations in accordance with article 15, paragraphs 2 and 3, of this Agreement.

Moon; and, (b) place their personnel, space vehicles, equipment, facilities, stations and installations anywhere on or below the surface of the Moon. Personnel, space vehicles, equipment, facilities, stations and installations may move or be moved freely over or below the surface of the Moon."

Does article I(2) of the Outer Space Treaty include in its scope commercial space activities such as those related to the exploitation of space natural resources? On the basis of article 31 of the Vienna Convention on the Law of Treaties,[82] since two words, "exploration and use", are mentioned in article I(2), it would mean that "use" has a wider meaning than "exploration". According to opinions expressed by a broad majority of authors, the term "use" includes space commercial activities.[83] It is difficult to contradict this statement since the general practice in the conduct of space activities clearly shows that the first "use" - since the commencement of space activities - has been the use of telecommunication and remote sensing satellites. Still today, the telecommunication sector is the largest commercial space activity sector. However, it has to be kept in mind that the telecommunication sector developed within the framework of the non-appropriation principle and ITU regulations. One author considers there are several freedoms in space which may be summarized by the expression "Lunar freedoms"[84] - freedom of exploration,[85] freedom of scientific investigation,[86] freedom of information and international cooperation,[87] freedom of use, and freedom of access to all areas[88] under the same conditions as are applicable in the high seas and in Antarctica. By analogy, the three areas – outer space, the high seas and Antarctica – are almost unlimited. The current spectrum of commercial space activities is not in contradiction with the freedom of space activities.

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[82] *Vienna Convention on the Law of Treaties* 23 May 1969, 1155 UNTS 331 [*VCLT*].
[83] KH Böckstiegel, "Legal implications of commercial space activities" in *Proceedings of the 24th Colloquium on the Law of Outer Space* (Roma, Italy: AIAA/IISL, 1981) 26. Oscar Fernandez Brital, *"Survey From Space of Earth Resources*" in *Proceedings of the 13th Colloquium On The Law Of Outer Space* (Constance, Germany: AIAA/IISL, 1970) 198. Matte, Space Activities and Emerging International Space Law. Centre for Research of Air and Space Law, McGill University, 1984.
[84] Bhatt, *supra* note 11
[85] *Outer Space Treaty*, *supra* note 1 art I(2).
[86] *Ibid* art I(3)
[87] *Ibid* art XI.
[88] *Ibid* art I.

Article 9(2) of the Moon Agreement[89] on freedom of access adds specific provisions relating to stations on the Moon and the fact that they must respect the freedom of access to the Moon of personnel, vehicles and equipment of other States Parties. Article 9(2) of the Moon Agreement contains a reference to article I of the Outer Space Treaty. It is parallel to article X of the Outer Space Treaty although the latter is formulated differently and has a broader scope as it includes celestial bodies.[90]

Finally, article 10(1)[91] of the Moon Agreement establishes the minimum provisions regarding the life and health of persons on the Moon. This article is an extension of article V of the Rescue and Return Agreement.[92] Its relevance resides in the fact that it provides sufficient content in the event that States Parties to the Moon Agreement have neither ratified the Outer Space Treaty nor the Rescue Agreement.

Since the Outer Space Treaty explicitly sets out the freedom of use principle in its article I, the Moon Agreement does not add much. What was added to the principle by the Moon Agreement in 1979 was linked to the mutual concerns of the US and USSR about potential future activities. Based on the wording of the Moon Agreement, an enlarged principle of freedom of exploration and use will be required in order to facilitate the exploitation of space natural resources. While the principles stated in articles 8(1), 8(2) and 9(2) of the Moon Agreement remain relevant today, there is a problem of consistency with the Outer Space Treaty, which may create difficulties for the states parties to the Moon Agreement but not for those who are party to the Outer Space Treaty. However,

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[89] *Moon Agreement*, *supra* note 2 art IX(2): Stations shall be installed in such a manner that they do not impede the free access to all areas of the Moon of personnel, vehicles and equipment of other States Parties conducting activities on the Moon in accordance with the provisions of this Agreement or of article I of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.

[90] *Outer Space Treaty*, *supra* note 1 art X: Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.

[91] *Moon Agreement*, *supra* note 2 art X(1): States Parties shall adopt all practicable measures to safeguard the life and health of persons on the Moon. For this purpose they shall regard any person on the Moon as an astronaut within the meaning of article V of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies and as part of the personnel of a spacecraft within the meaning of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space. 2. States Parties shall offer shelter in their stations, installations, vehicles and other facilities to persons in distress on the Moon.

[92] *Rescue and Return Agreement*, *supra* note 9 art V.

should the provisions of the Moon Agreement not be applicable, the Outer Space Treaty contains sufficient general principles.

5. THE FUNDAMENTAL FREEDOM OF SCIENTIFIC INVESTIGATION PRINCIPLE

The principle of freedom of scientific investigation is a fundamental principle related to international scientific cooperation in an international area and requires particular attention. Article I(3) of the Outer Space Treaty refers to freedom of scientific investigation in outer space, including the Moon and other celestial bodies. Article 6(1) of the Moon Agreement further elaborates[93] on the principle by adding requirements of non–discrimination as well as respect for the principle of equality and international law. The wording goes well beyond the Outer Space Treaty but remains limited to scientific investigation.

In its article 6(2),[94] the Moon Agreement goes further by describing activities that are permitted with regard to space resources, thereby basically transforming the practices of both the US and Russia into international legal norms.[95] Thus, States Parties have the right to collect and remove from the Moon samples of its mineral and other substances. It can be deducted from the foregoing that during the negotiation of the Agreement, the meaning of the "natural resources" of the Moon was restricted to "mineral and other substances". State practice, particularly the practices of the US and Russia, suggests that samples remain at the disposal of the States that collected them. There is the possibility of making them available to other States Parties and to the international scientific community. Finally, it is clearly stated that they can use those minerals and other substances of the Moon in quantities appropriate for the support of their mission. Article

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[93] *Moon Agreement*, *supra* note 2 art 6(1): There shall be freedom of scientific investigation on the Moon by all States Parties without discrimination of any kind, on the basis of equality and in accordance with international law.

[94] *Moon Agreement*, *supra* note 2 art 6(2). In carrying out scientific investigations and in furtherance of the provisions of this Agreement, the States Parties shall have the right to collect on and remove from the Moon samples of its mineral and other substances. Such samples shall remain at the disposal of those States Parties which caused them to be collected and may be used by them for scientific purposes. States Parties shall have regard to the desirability of making a portion of such samples available to other interested States Parties and the international scientific community for scientific investigation. States Parties may in the course of scientific investigations also use mineral and other substances of the Moon in quantities appropriate for the support of their missions.

[95] *Galloway Report*, *supra* note 18 at 52.

6(2) is of tremendous importance as it circumscribes what is allowed in terms of activities related to the natural resources in the realm of scientific investigations.

Scientific investigation falls under exploration, not exploitation.[96] The provisions of the Moon Agreement establish minimum acceptable standards governing the use of space natural resources for scientific investigation purposes. As long as there is no international regime in place as foreseen by article 11, article 6(2) will continue to apply to the use of the samples for scientific investigation purposes. In the new international regime related to the exploitation of space natural resources, it will be extremely necessary to keep a clear distinction between the collection and removal of space natural resources for mission needs and scientific investigations on the one hand and true commercial exploitation on the other.

6. NON CONTAMINATION AND CREATION OF THE INTERNATIONAL SCIENTIFIC PRESERVES

Environmental issues are important when dealing with space natural resources. Article IX of the Outer Space Treaty states: […] States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose […]. This provision is the foundation of all the planetary protection mechanisms required to be undertaken in any scientific mission to space.

[96] For the definition of exploitation, see *infra* Chapter III under IV.

Article 7[97] of the Moon Agreement is the mirror provision of the Outer Space Treaty's article IX. It provides: "1. States Parties shall take measures to prevent the disruption of the existing balance of its environment, whether by introducing adverse changes in that environment, by its harmful contamination through the introduction of extra-environmental matter or otherwise. States Parties shall also take measures to avoid harmfully affecting the environment of the earth through the introduction of extraterrestrial matter or otherwise." Article 7(3) of the Moon Agreement extends the provisions of article IX of the Outer Space Treaty by adding that areas of the Moon that are of special scientific interest may be designated as "international scientific preserves," a fundamental provision that makes a connection between environmental preservation and international scientific investigations. This provision was discussed at the beginning of the negotiations preceding the Moon Agreement.

For Galloway, there is an international objective and an expanding role for the UN. It "implies that plans for a future international regime should include its interacting relationship with the UN and its specialized agencies".[98] Further, Galloway is of the opinion that COPUOS' intention with this provision was not to prohibit the exploitation of natural resources but ensure that they are carried out with minimal disruption or adverse effects to "the existing balance for [sic] the environment." This opinion is derived from the negotiating history of the agreement and the adoption of the "understandings."[99] It is

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[97] *Moon Agreement*, *supra* note 2 art VII(1). In exploring and using the Moon, States Parties shall take measures to prevent the disruption of the existing balance of its environment, whether by introducing adverse changes in that environment, by its harmful contamination through the introduction of extra-environmental matter or otherwise. States Parties shall also take measures to avoid harmfully affecting the environment of the Earth through the introduction of extraterrestrial matter or otherwise; 2. Secretary-General of the United Nations of the measures being adopted by them in accordance with paragraph 1 of this article and shall also, to the maximum extent feasible, notify him in advance of all placements by them of radioactive materials on the Moon and of the purposes of such placements 3. States Parties shall report to other States Parties and to the Secretary-General concerning areas of the Moon having special scientific interest in order that, without prejudice to the rights of other States Parties, consideration may be given to the designation of such areas as international scientific preserves for which special protective arrangements are to be agreed upon in consultation with the competent bodies of the United Nations.

[98] Galloway Article, *supra* note 25 at 497.

[99] According to paragraph 65 the report of the Committee, article 7 reflects one of the understandings reached in 1979: "the Committee agreed that article 7 is not intended to result in prohibiting the exploitation of natural resources which may be found on celestial bodies other than the earth, but, rather, that such exploitation will be carried out in such a manner as to *minimize any disruption or adverse effects to the existing balance of the environment.*" [Emphasis added]. See Galloway Report, *supra* note 18.

interesting to note[100] that all activities need to be compatible with article 11(7) and article 6(2) of the Agreement. States Parties are to share samples with other "interested States Parties," and this is different from US and USSR policies of the time where Moon samples were shared with other interested states, not necessarily States Parties to the Treaty. Any future exploitation of space natural resources will need to comply with the non-contamination principle and all the relevant planetary protection mechanisms in order to guarantee the necessary protection of the outer space environment. [101]

Precise rules must be adopted and enforced in order to prevent the incidence of contamination in an international environment. Any international legal regime on the exploitation of space natural resources must include strict and precise provisions on environment preservation as is the case in legal regimes governing exploitative activities in other international areas.[102] The notion of international scientific preserves must be kept and could also be used for the celestial bodies. By providing a specific protection mechanism for some areas on the Moon and celestial bodies, this would create a special status with dedicated protection. It could notably be the case for the dark side of the Moon. Environmental preservation in space is relevant to the exploitation of space natural resources. Exploitative activities will need to respect the above mentioned rules and provisions built on the 1979 "understandings". In addition, certain resources may be permanently excluded from exploitation in order to preserve the space environment.

7. LEGAL MECHANISMS DEALING WITH STATE RESPONSIBILITY AND LIABILITY OFFER ADDITIONAL POSSIBILITIES

First, an overview of the provisions of the Outer Space Treaty and the Moon Agreement dealing with responsibility and liability is presented before addressing their impact on the exploitation of space natural resources. Article VI of the Outer Space Treaty provides that:

> States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental

[100] *Ibid*.
[101] Notably the Planetary Protection Policy of the Committee on Space Research (COSPAR) as well as other national mechanisms. For the COSPAR Planetary Protection Policy, see online: COSPAR <http://cosparhq.cnes.fr/About/about.htm> (date accessed: March 13, 2012).
[102] See *infra* Chapter III for an exposition on the law of the Sea and of Antarctica.

> entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.

This principle represents a carefully balanced compromise between the two space powers as both were built on total different economic systems. The USSR wanted to limit States Parties' international responsibility to the space activities conducted by governmental agencies while the US was ready to extend such international responsibility to the space activities carried out by private entities.[103] Although article 14(1)[104] of the Moon Agreement neither mentions outer space nor contains specific clauses on international organizations, it is parallel to article VI of the Outer Space Treaty.

Activities carried out in space by non-governmental entities are increasing. Under normal circumstances, non-governmental entities do not require the authorization of a state in most countries to conduct commercial activities, as long as the law permits the activity. In outer space, however, things are different. In essence, article VI of the Outer Space Treaty requires States Parties to establish a licensing system to regulate the conduct of space activities by non-governmental entities. According to Kopal,[105] this requirement is both logical and reasonable: article VI of the Outer Space Treaty establishes international responsibility for all national activities, whether such activities are carried by governmental agencies or by non-governmental entities, for assuring that national activities are carried out in conformity with the provisions of the Outer Space Treaty. It is not possible to give a different interpretation of the same adjective "national" appearing in

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[103] Ronald L Spencer, "State Supervision of Space Activity" (2009) 63 Air Force Law Review, online: Vlex <http://vlex.com/vid/state-supervision-of-space-activity-65774583> (date accessed: March 13, 2012)

[104] *Moon Agreement*, *supra* note 2 art 14(1). States Parties to this Agreement shall bear international responsibility for national activities on the Moon, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in this Agreement. States Parties shall ensure that non-governmental entities under their jurisdiction shall engage in activities on the Moon only under the authority and continuing supervision of the appropriate State Party.

[105] Vladimir Kopal, "Comments on the issue Adequacy of the Current Legal and Regulatory Framework Relating to the Extraction and Appropriation of Natural Resources of the Moon" in *Proceedings of the International and Interdisciplinary Workshop on Policy and Law Relating to Outer Space Resources: the Example of the Moon, Mars and other Celestial Bodies* (McGill: Montreal, 2006) [Kopal].

different provisions of the same legal instrument, unless such a difference is clearly defined in the text of the Treaty concerned. As studied below, article II of the Outer Space Treaty prohibits national appropriation of outer space "by claim of sovereignty, by means of use or occupation, or by any other means."[106] As used in article VI, the term "national" includes both governmental and non-governmental entities in the same manner as it applies under article II of the Outer Space Treaty.[107]

This reasoning leads us to the whole issue of the definition of "appropriate" state – the state that exercises jurisdiction and control over the space object, the state of nationality. If after the launch, all these links point to one state, there is only one appropriate state. If the entity conducting the space activity exclusively holds the nationality of a state, that state will be the state of nationality. The analysis becomes complicated if the entity is multi-national or international. Under the provisions of article VI(1) of the Outer Space Treaty, the state whose nationality is carried by the entity engaged in space activities[108] is responsible for those national activities. This state is obliged to license and continuously supervise activities conducted by the non-governmental entity. According to Silverstrov, "[i]nternational space law provides a whole set of possible links between certain states and the space object."[109] With the criteria, there could be several "appropriate" states. It could be the launching state or any other state. Before the launching of the space object, the appropriate state could be the state of nationality of the entity carrying out the activity in question. It could also be the state that procures the launch or whose territory or facilities are used for the space activity. After the launch, the state of registry is the exclusive "appropriate" state under and by virtue of article VIII of the Outer Space Treaty. As a consequence, there is only one state of registry while several "appropriate" states may co-exist at the "launching" stage. The "appropriate" state has a "jurisdictional" function. Silverstrov suggests that, in order to clarify the provisions of the Outer Space Treaty relating to the appropriate state, COPUOS should define the notion of "appropriate" state in multilateral or bilateral

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[106] *Outer Space Treaty*, *supra* note 1 art II. See *Infra* IV. 1.6.
[107] For further analysis, see *infra* under IV.
[108] G Silverstrov, "On the Notion of the 'Appropriate' State in Article IV of the Outer Space Treaty" in *Proceedings of the 34th Colloquium on the Law of Outer Space* (Herndon VA: AIAA/IISL, 1991) 326 [Silverstrov].
[109] *Ibid.*

agreements or via a special project. At the end of the negotiations for the Outer Space Treaty, it was clear, at least to the Canadian delegation, that both titles were included in article II.[110] However, France and Canada considered that "the […] text did not make clear that outer space was not subject to national sovereignty and that no one could acquire property rights in outer space."[111]

Article VI of the Outer Space Treaty has raised a lot of concern over the years, notably in connection with the fact that it would not be applicable to space activities conducted by private companies. This has led to the circulation of misunderstandings and wrong information in different fora. On 22 March 2009, the Board of Directors of the International Institute of Space Law expressed the following opinion:

> The current international legal regime is binding both on States, and through the precise wording of Article VI of the Outer Space Treaty of 1967, which has been ratified by 100 countries, including all the space-faring countries, also on non-governmental entities, i.e. individuals, legal persons and private companies. The clear goal of such a regime is to preserve outer space, including the Moon and other celestial bodies, for the exploration and use of all mankind, not only for those States and private enterprises that are capable of doing so at any particular time.[112]

This statement has no legal force and effect under international law. However, considering the role of the IISL in the development of international space law and the expertise of the members of its Board of Directors, the statement deserves to be taken into account as evidencing the teachings of the most highly qualified publicists. The statement could therefore be used as a subsidiary means of interpreting the provisions of article VI of the Outer Space Treaty. It is believed that some consolidation is required in order to avoid further questioning of these fundamental principles of international space law.

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[110] UNCOPUOS, Legal Sub-Committee, Fifth Session, *Summary Record of the 70th Meeting of the Legal Sub-Committee*, UN Doc A/AC.105/C.2/SR.70 at 13 [*Summary Record of the 70th Meeting of the Fifth Session of the UNCOPUOS Legal Sub-Committee*].

[111] UNCOPUOS, Fifth Session, *Summary Record of the 71st Meeting of the Legal Sub-Committee*, UN Doc A/AC.105/C.2/SR.71 Add. 1 at 15 [*Summary Record of the 71st Meeting of the Fifth Session of the UNCOPUOS Legal Sub-Committee*].

[112] Statement of the Board of Directors of the International Institute of Space Law, IISL online :<http://www.iislweb.org/docs/Statement%20BoD.pdf>. (date accessed: March 13, 2012).

Article VII[113] of the Outer Space Treaty enunciates the principles regarding liability for damage caused by a space object. Such liability attaches to the launching State. The 1972 Liability Convention further elaborates upon the liability principles set up in the Outer Space Treaty. "A launching State shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the Earth or to aircraft in flight. In the event of damage being caused elsewhere than on the surface of the Earth to a space object of one launching State or to persons or property on board such a space object by a space object of another launching State, the latter shall be liable only if the damage is due to its fault or the fault of persons for whom it is responsible."[114]

In addition to the above-mentioned liability provisions of the Outer Space Treaty and the Liability Convention, article 14(2) of the Moon Agreement goes further to create a framework in which it is possible to set up separate arrangements for damage caused due to extensive activities on the Moon. It provides: "States Parties recognize that detailed arrangements concerning liability for damage caused on the Moon, (…), may become necessary as a result of more extensive activities on the Moon. Any such arrangements shall be elaborated in accordance with the procedure provided for in article 18 of this Agreement."[115]

The question of international liability and "appropriate State" is of particular interest in the exploitation of space natural resources. The effect of the principle of authorization and continuing supervision is to give a State - "the appropriate State" - a specific responsibility. Both governmental and non-governmental entities cannot perform space activities unless they have previously been authorized to do so by the appropriate state. For our present purposes, this means that the exploitation of space natural resources requires authorization and continuing supervision by an appropriate state. The commercial development of space (e.g., telecommunications and remote sensing satellites) took place in this manner and this provision is not an obstacle to the

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[113] *Outer Space Treaty*, *supra* note 1 art VII: Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the Moon and other celestial bodies.
[114] *Liability Convention*, supra note 9.
[115] *Moon Agreement*, *supra* note 2 art 14(2).

exploitation of the resources. Despite the opinion expressed by some private activists[116] that the role of the government in space needs to be changed, the current mechanism is fully compatible with the exploitation of the resources.

The liability mechanism and its relationship to the exploitation of space natural resources is a complex matter. Although the current provisions are fully applicable to the exploitation of space natural resources, it is very likely that separate agreements will be needed to adequately cover the specific problems of resource exploitation.

As a fundamental principle, the wording of the Moon Agreement is used in pursuing the objective of the present thesis. It is necessary to introduce outer space and the Moon for those States Parties that are not party to the Outer Space Treaty. Finally, there is a need for a mirror provision on international organizations. The possibility to set up separate arrangements concerning the liability for damage occurring on the Moon also needs to be kept as future activities on the Moon will probably require the execution of such specific agreements. For example, this will be the case when international partners decide to establish a lunar base, or a dedicated arrangement relating to a specific resource. The contents will need to be in line with the relationship between the existing rules and the exploitation of space natural resources. A step by step approach could be helpful in regulating specific resources as and when discovered. This is what pertains under the Law of the Sea.

8. THE PRINCIPLE OF COOPERATION AND MUTUAL ASSISTANCE ALSO OFFERS ADDITIONAL POSSIBILITIES

In her report, Galloway underlines the fact that, as compared to previous texts in international law, the Outer Space Treaty goes far beyond others in providing for international cooperation for peaceful purposes (e.g., activities to be carried out for the benefit and in the interests of all countries; outer space to be the province of all mankind; freedom for exploration and use by all States without discrimination of any kind; freedom of access etc). In this regard, it is interesting to reproduce a statement that Galloway claims was made by President Johnson on May 7, 1967:

[116] See *supra* Chapter II.

> Just as the United States is striving to help achieve peace on earth, we want to do what we can to insure that exploration of the moon and other celestial bodies will be for peaceful purposes only. We want to be sure that our astronauts and those of other nations can freely conduct scientific investigations of the moon. We want the results of these activities to be available for all mankind.

On the day of signing the treaty, President Johnson is also reported to have stated that the Outer Space Treaty: "carries forward the thrust of the past decade to enlarge the perimeters of peace by shrinking the arenas of potential conflict."[117]

The principle of cooperation and mutual assistance is well addressed under general principles of international law, the Outer Space Treaty and the Moon Agreement. Article III of the 1967 Outer Space Treaty obliges States Parties to respect international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding. Article IX also states that in the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty. International cooperation is an essential aspect of all space activities. However, it is not a duty and there is no sanction for its non-observance. Rather, States that refuse to cooperate in the conduct of space activities are morally criticized by other States for their non-cooperative behaviour.

Both the Outer Space Treaty and the Moon Agreement support the principle of international cooperation and mutual assistance. However, although the Moon Agreement does not apply to outer space, its provisions are more comprehensive as compared to those of the Outer Space Treaty. Article 4(2) of the Moon Agreement, for example, states the following: "international cooperation in pursuance of this Agreement should be as wide as possible and may take place on a multilateral basis, on a bilateral basis or through international intergovernmental organizations".[118]

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[117] *Galloway Report*, *supra* note 18 at 5-6.

[118] *Moon Agreement*, *supra* note 2 art 4(1): The exploration and use of the Moon shall be the province of all mankind and shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development. Due regard shall be paid to the interests of present and future

These principles are highly relevant when dealing with resources exploitation. The conduct of commercial activity in space does not contradict the obligation upon states to maintain respect for the principle of international cooperation. The main benefit of space exploration is clearly international cooperation. As seen in the first chapter, major space exploration programs are typically conducted under cooperative arrangements between states. The possibility offered by the principle of international cooperation to create additional legal norms needs to be maintained in any future regime governing the exploitation of space natural resources. As mentioned above, if the States Parties to the Moon Agreement decide to build a lunar base, for example, a multilateral agreement would certainly be necessary. This provision is important for the countries which are parties to the Agreement. A provision on cooperation as a consequence needs to be maintained in any future regime related to the exploitation of space natural resources. However, should the Moon Agreement not be applicable, the provisions of the Outer Space Treaty are satisfactory.

9. RESPECT OF INTERNATIONAL LAW

Respect of international law is addressed several times in the Moon Agreement. Article 11(4) of the Moon Agreement recalls the right of States Parties to explore and use the Moon in accordance with international law in the same fashion as article 1(2) of the Outer Space Treaty. However, the Moon Agreement goes a bit further. Its article 2[119] requires that all activities on the Moon shall be carried out in accordance with international law, in particular, the UN Charter, taking into account the Principles of International Law concerning Friendly Relations and Cooperation among States in the interest of maintaining international peace and security. This is a traditional provision in

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generations as well as to the need to promote higher standards of living and conditions of economic and social progress and development in accordance with the Charter of the United Nations. 2. States Parties shall be guided by the principle of cooperation and mutual assistance in all their activities concerning the exploration and use of the Moon. International cooperation in pursuance of this Agreement should be as wide as possible and may take place on a multilateral basis, on a bilateral basis or through international intergovernmental organizations.

[119] *Ibid*, art 2: All activities on the Moon, including its exploration and use, shall be carried out in accordance with international law, in particular the Charter of the United Nations, and taking into account the Declaration on Principles of International Law concerning Friendly Relations and Cooperation among States in accordance with the Charter of the United Nations […] in the interest of maintaining international peace and security and promoting international cooperation and mutual understanding, and with due regard to the corresponding interests of all other States Parties.

many international treaties. It has immense implications for the establishment of an international legal regime to govern the exploitation of space natural resources. Those provisions are close to article IX of the Outer Space Treaty.[120]

10. SETTLEMENT OF DISPUTES

Article 8(3) of the Moon Agreement requires States Parties "not to interfere with the activities of other States Parties on the Moon" and to request into international consultations in accordance with article 15(2)[121] when there is reason to believe that another State Party is not fulfilling the obligations incumbent upon it pursuant to the Agreement or that another State Party is interfering with the rights which the former State has under the Agreement. The consultations envisaged under article 15(2) are more detailed and comprehensive as compared to those required under article IX of the Outer Space Treaty.[122] Further, under article 15(3)[123] of the Moon Agreement, if difficulties arise in connection with the opening of consultations, or if consultations do not lead to a

[120] *Outer Space Treaty*, *supra* note 1 art IX: If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, may request consultation concerning the activity or experiment.

[121] *Moon Agreement*, *supra* note 2 art 15(2): A State Party which has reason to believe that another State Party is not fulfilling the obligations incumbent upon it pursuant to this Agreement or that another State Party is interfering with the rights which the former State has under this Agreement may request consultations with that State Party. A State Party receiving such a request shall enter into such consultations without delay. Any other State Party which requests to do so shall be entitled to take part in the consultations. Each State Party participating in such consultations shall seek a mutually acceptable resolution of any controversy and shall bear in mind the rights and interests of all States Parties. The Secretary-General of the United Nations shall be informed of the results of the consultations and shall transmit the information received to all States Parties concerned.

[122] *Outer Space Treaty*, *supra* note 1 art IX: In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty. […]

[123] *Moon Agreement*, *supra* note 2 art 15(3): If the consultations do not lead to a mutually acceptable settlement which has due regard for the rights and interests of all States Parties, the parties concerned shall take all measures to settle the dispute by other peaceful means of their choice appropriate to the circumstances and the nature of the dispute. If difficulties arise in connection with the opening of consultations or if consultations do not lead to a mutually acceptable settlement, any State Party may seek the assistance of the Secretary-General, without seeking the consent of any other State Party concerned, in order to resolve the controversy. A State Party which does not maintain diplomatic relations with another State Party concerned shall participate in such consultations, at its choice, either itself or through another State Party or the Secretary-General as intermediary.

mutually acceptable settlement, any State Party may seek the assistance of the Secretary-General of the United Nations, without seeking the consent of any other State Party concerned, in order to resolve the controversy. This means that if the States Parties do not find a solution, they will have to deal with the UN 1970 Declaration[124] Concerning Friendly Relations.[125]

While the Outer Space Treaty does not contain any provision on the settlement of disputes despite several initiatives,[126] the Moon Agreement refers to a dedicated Declaration on Friendly Relations among States. Among the principles[127] proclaimed in the Declaration, "States shall settle their international disputes by peaceful means in such a manner that international peace and security and justice are not endangered". Further, "States shall seek early and just settlement of their international disputes by negotiation, inquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies or arrangements or other peaceful means of their choices."

In the case of conflicts occurring during the conduct of activities on the Moon, it is extremely important to have a legal mechanism that provides a means to resolve such disputes in a peaceful manner. Such activities will require *in-situ* exploitation of natural resources by actors from different entities - private and public - and belonging to different countries or an international organisation. With potential scientific discoveries and commercial interests at stake, conflicts may arise. The need for a dispute settlement

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[124] UN General Assembly, *Declaration of Principles of International Law Concerning Friendly Relations and Co-operation Among States in Accordance with the Charter of the United Nations*, 24 October 1970, available at: <http://www.unhcr.org/refworld/docid/3dda1f104.html> (date accessed: June 25, 2012).

[125] *Moon Agreement*, *supra* note 2 art 8(3): Activities of States Parties in accordance with paragraphs 1 and 2 of this article shall not interfere with the activities of other States Parties on the Moon. Where such interference may occur, the States Parties concerned shall undertake consultations in accordance with article 15(2) and (3), of this Agreement.

[126] Several initiatives were introduced to develop a dispute settlement mechanism under international space law. Böckstiegel, for instance, initiated a draft convention that was placed on the agenda of the agenda of the colloquium. K-H Böckstiegel, "Convention on the settlement of space law disputes" in *Proceedings of the 26th Colloquium on the Law of Outer Space* (Herndon, VA: AIAA/IISL, 1983) 179.

[127] See *Supra* note 2 art 2 (on the 1970 Declaration). The Declaration contains: (a) The principle that States shall refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any State, or in any other manner inconsistent with the purposes of the United Nations, (b) The principle that States shall settle their international disputes by peaceful means in such a manner that international peace and security and justice are not endangered, (c) The duty not to intervene in matters within the domestic jurisdiction of any State, in accordance with the Charter, (d) The duty of States to co-operate with one another in accordance with the Charter, (e) The principle of equal rights and self-determination of peoples, (f) The principle of sovereign equality of States, (g) The principle that States shall fulfill in good faith the obligations assumed by them in accordance with the Charter.

mechanism is imperative considering the increasing role of commercial activities in space and consequently, the exponential increase in the potential number of conflicts.

In this connection, article 2 of the Moon Agreement provides a reinforced mechanism by referring to the Declaration on Principles of International law Concerning Friendly Relations and Cooperation among States. The absence of a dispute settlement mechanism, as is the case under the Outer Space Treaty, does not prevent commercial activities from occurring. A legal framework on the exploitation of space natural resources may not be sufficient if there are no means of enforcement and dispute settlement.

11. OBLIGATION OF INFORMATION IS STRONGLY REINFORCED

In the spirit of encouraging international cooperation and a free exchange of information regarding the activities taking place on the Moon, the Moon Agreement contains several specific provisions related to the obligation of information. First, article 5[128] of the Moon Agreement establishes a global obligation upon States Parties to inform the UN Secretary-General, the public and the international scientific community about their activities on the Moon "to the greatest extent feasible and practicable." The specific particulars that must be furnished in order to meet this obligation are stated in detail: "time, purposes, locations, orbital parameters and duration for each mission to the Moon as soon as possible after launching." Secondly, upon completion of the mission, information on the results must also be provided. The Moon Agreement has established a timeframe for the performance of this obligation of information.

[128] *Moon Agreement*, *supra* note 2 art 5(1): States Parties shall inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of their activities concerned with the exploration and use of the Moon. Information on the time, purposes, locations, orbital parameters and duration shall be given in respect of each mission to the Moon as soon as possible after launching, while information on the results of each mission, including scientific results, shall be furnished upon completion of the mission. In the case of a mission lasting more than sixty days, information on conduct of the mission, including any scientific results, shall be given periodically, at thirty-day intervals. For missions lasting more than six months, only significant additions to such information need be reported thereafter.

The mirror provision in the Outer Space Treaty is article XI.[129] Both texts require that the information must be submitted to the UN Secretary-General, the public and the international scientific community. They also require that states must comply with the obligation of information "to the greatest extent feasible and practicable." However, article XI of the Outer Space Treaty differs in the sense that it does not prescribe time limits for the discharge of this obligation. Article XI further provides that, upon receipt, the UN Secretary General must disseminate such information immediately and effectively while there is no such dissemination provision in the Moon Agreement. Art 5(2) of the Moon Agreement mentions the conditions that should be taken into account in the event that two or more States Parties have plans to operate simultaneously in the same area.[130] Article IX of the Outer Space Treaty addresses the same issue but from a different perspective. States Parties to both agreements would certainly have the choice of the procedure.[131] Finally, under article 5(3) of the Moon Agreement, States Parties have an obligation to inform the Secretary General, the general public and the international scientific community about any phenomena they discover in outer space, including the Moon, which could endanger human life or health, as well as of any indication of organic life. This provision clearly builds upon the provisions contained in articles V and XI of

[129] *Outer Space Treaty*, *supra* note 1 art XI: In order to promote international cooperation in the peaceful exploration and use of outer space, States Parties to the Treaty conducting activities in outer space, including the Moon and other celestial bodies, agree to inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities. On receiving the said information, the Secretary-General of the United Nations should be prepared to disseminate it immediately and effectively.

[130] *Moon Agreement*, *supra* note 2 art 5(2): If a State Party becomes aware that another State Party plans to operate simultaneously in the same area of or in the same orbit around or trajectory to or around the Moon, it shall promptly inform the other State of the timing of and plans for its own operations.

[131] *Outer Space Treaty*, *supra* note 1 art IX: If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, may request consultation concerning the activity or experiment.

the Outer Space Treaty.[132] While the objectives of both texts are relevant and need to be kept, some consistency between the two texts would be necessary.

The Moon Agreement needs to be maintained as the basis for any future regime on resource exploitation. However, its information obligations may have to be modified in the future. Under the existing provisions, a state not wishing to communicate too much about its activities on the Moon may avoid that obligation merely by stating that the duration of the mission does not exceed 6 months. A provision on the dissemination of results also needs to be added to the Moon Agreement to bring it in line with the Outer Space Treaty. When it comes to the provision of information about the nature of missions to the Moon, the provisions of the Moon Agreement are fully in line with those of the Outer Space Treaty. In both cases, this must be done "to the greatest extent feasible and practicable". It is regrettable that the Moon Agreement does not contain more specific provisions. Past experience shows that the lack of detailed requirements in provisions requiring states to furnish information may impact the conduct of space activities. This has been the case with regard to the obligation to register space objects. Under the Registration Convention,[133] such information shall be furnished to the UN Secretary-General "as soon as practicable". With the increasing number of launches, the absence of an obligation to provide more precise information presents several challenges relating to the identification of the spacecraft, the cessation or the transfer of operations, and space debris.

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[132] *Ibid*, art V: […] States Parties to the Treaty shall immediately inform the other States Parties to the Treaty or the Secretary-General of the United Nations of any phenomena they discover in outer space, including the Moon and other celestial bodies, which could constitute a danger to the life or health of astronauts. See also *ibid* art XI: State Parties […] agree to agree to inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities. On receiving the said information, the Secretary-General of the United Nations should be prepared to disseminate it immediately and effectively.

[133] *Registration Convention*, *supra* note 9 art IV provides that:

1. Each State of registry shall furnish to the Secretary-General of the United Nations, as soon as practicable, the following information concerning each space object carried on its registry: (a) name of launching State or States; (b) an appropriate designator of the space object or its registration number; (c) date and territory or location of launch; (d) basic orbital parameters, including: (i) nodal period; (ii) inclination; (iii) apogee; (iv) perigee; (e) general function of the space object.
2. Each State of registry may, from time to time, provide the Secretary-General of the United Nations with additional information concerning a space object carried on its registry.
3. Each State of registry shall notify the Secretary-General of the United Nations, to the greatest extent feasible and as soon as practicable, of space objects concerning which it has previously transmitted information, and which have been but no longer are in earth orbit.

The other information-related provisions of the Moon Agreement are specific to activities carried out on the Moon. Article 7,[134] for instance, deals with information relating to the Moon environment and radioactive materials. Article 9[135] is related to information on activities concerning the placement of stations on the Moon. Galloway underlines[136] that article 9 of the Moon Agreement is an extension of articles I and XI of the Outer Space Treaty and also of article IV of the Registration Convention which requires states to furnish specific information concerning each space object to the Secretary-General of the UN. This is fully reflective of the progressive codification of international space law by the treaties. The fundamental document - the Outer Space Treaty - first set out the general principles and subsequent Agreements have strengthened and/or developed these original principles further.

Article 12(2)[137] of the Moon Agreement requires that vehicles, installations and equipment or the component parts thereof found in places other than their intended location must be dealt in accordance with article V of the Rescue and Return Agreement. This provision deals with an obligation relating to information received about and discoveries related to space objects. States Parties to the Moon Agreement have thereby undertaken to respect a provision of another international treaty. In case of emergency, article 12(3)[138] of the Moon Agreement allows parties to use equipment, vehicles, installations and facilities belonging to other States Parties on the Moon. There is an obligation to inform the state party concerned in such circumstances; however, there is no

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[134] *Moon Agreement*, *supra* note 2 art 7(2): States Parties shall inform the Secretary-General of the United Nations of the measures being adopted by them in accordance with paragraph 1 of this article and shall also, to the maximum extent feasible, notify him in advance of all placements by them of radioactive materials on the Moon and of the purposes of such placements.

[135] *Ibid*, art 9(1): States Parties may establish manned and unmanned stations on the Moon. A State Party establishing a station shall use only that area which is required for the needs of the station and shall immediately inform the Secretary-General of the United Nations of the location and purposes of that station. Subsequently, at annual intervals that State shall likewise inform the Secretary-General whether the station continues in use and whether its purposes have changed.

[136] *Galloway Report*, *supra* note 18 at 55.

[137] *Moon Agreement*, *supra* note 2 art 12(2): Vehicles, installations and equipment or their component parts found in places other than their intended location shall be dealt with in accordance with article 5 of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.

[138] *Moon Agreement*, *supra* note 2 art 12(3): In the event of an emergency involving a threat to human life, States Parties may use the equipment, vehicles, installations, facilities or supplies of other States Parties on the Moon. Prompt notification of such use shall be made to the Secretary-General of the United Nations or the State Party concerned.

need to wait for assistance. Finally, article 13[139] of the Moon Agreement addresses the obligation of assistance. In terms of the obligation of information, both articles 12(3) and 13 of the Moon Agreement go well beyond with the requirements of article V[140] of the Rescue and Return Agreement.

Article 11(6)[141] of the Moon Agreement deals with the discovery of natural resources and it requires prompt action in notifying the UN about newly discovered celestial bodies. It constitutes a new element as compared to the Outer Space Treaty. These provisions have a great impact on the exploitation of space natural resources: environmental impact; scientific impact (as discoveries can be made); commercial impact (depending on the level of business to develop); and, international impact (as space activities are carried out in an international area). In this regard, to safeguard the different interests, the exchange of information is extremely important since space is not a normal place of business. For the above reasons, the provisions need to be maintained for any future regime on exploitation of space natural resources.

It is interesting to note that for each of these fundamental principles of international space law, the Moon Agreement goes a bit further and as such reinforces and expands the principles of the Outer Space Treaty. Considering the success so far met by the Outer Space Treaty to cover the legal framework of institutional and commercial activities, it demonstrates at least the significant legal value of the Moon Agreement.

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[139] *Ibid*, art 13: A State Party which learns of the crash landing, forced landing or other unintended landing on the Moon of a space object, or its component parts, that were not launched by it, shall promptly inform the launching State Party and the Secretary-General of the United Nations.

[140] *Rescue and Return Agreement*, *supra* note 9 art V: States Parties to the Treaty shall regard astronauts as envoys of mankind in outer space and shall render to them all possible assistance in the event of accident, distress, or emergency landing on the territory of another State Party or on the high seas. When astronauts make such a landing, they shall be safely and promptly returned to the State of registry of their space vehicle. In carrying on activities in outer space and on celestial bodies, the astronauts of one State Party shall render all possible assistance to the astronauts of other States Parties. States Parties to the Treaty shall immediately inform the other States Parties to the Treaty or the Secretary-General of the United Nations of any phenomena they discover in outer space, including the Moon and other celestial bodies, which could constitute a danger to the life or health of astronauts.

[141] *Moon Agreement*, *supra* note 2 art 11(6): In order to facilitate the establishment of the international regime referred to in paragraph 5 of this article, States Parties shall inform the Secretary- General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of any natural resources they may discover on the Moon.

IV. PROVISIONS OF PARTICULAR RELEVANCE FOR A LEGAL FRAMEWORK GOVERNING THE EXPLOITATION OF SPACE NATURAL RESOURCES

The objective of this section is to provide a detailed analysis of the principles of the Moon Agreement that are most relevant to the development of an international legal regime on the exploitation of space natural resources. These principles have also been the most controversial in the context of the Moon Agreement and they include: the non-appropriation principle; the concept of Common Heritage of Mankind and the question of establishing an international legal regime on the resources of the Moon.

1. THE NON-APPROPRIATION PRINCIPLE IS REINFORCED

Article II of the Outer Space Treaty states: "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."[142] Before addressing the question of non-appropriation in relation to the exploitation of space natural resources, it is necessary to look at the historical context of the non-appropriation principle and the scope of article II.

1.1 HISTORICAL CONTEXT

The non-appropriation doctrine emerged after the Second World War with the adoption of the Antarctic Treaty in 1959.[143] In the past, frequent national claims over title to new territories reflected the state of international law and international relations. Factors that supported national claims to territory were geographical situation, human settlement and acts of administration. No claim occurred in outer space or in respect of celestial bodies. But for the non-appropriation clause, the exercise of state sovereignty over celestial bodies would have been technically possible, and it would have extended to the right to extract and use natural resources which are not otherwise owned by another state. The only limitation to the foregoing – the duty to refrain from endangering others – would be applicable in the context of the international law of state responsibility for injuries caused outside the territorial jurisdiction.[144] By virtue of the provisions of article

[142] *Outer Space Treaty*, *supra* note 1 art II.
[143] *Antarctic Treaty*, 1 December 1959, 12 UST 794, 402 UNTS 71, 19 ILM 860 [*Antarctic Treaty*].
[144] Brooke, *supra* note 75.

11 of the Moon Agreement, however, the Moon and other celestial bodies are not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.[145] The wording of article 11(2) is exactly the same as that appearing in article II of the Outer Space Treaty. As such, the non-appropriation provisions of the Moon Agreement were already codified by article II of the Outer Space Treaty. It is necessary to develop the principles found in article II of the Outer Space Treaty to avoid their misinterpretation.

In UNGA Resolutions 1721 and 1962, the term "sovereignty" was replaced with the term "appropriation." The French representative raised the following issue: "the reference to conformity with international law in both the Soviet and the United States texts was perhaps not as clear as it seemed a priori, if international law was based on sovereignty, how could one act within that law if the principle was proclaimed that there was no sovereignty in space and on celestial bodies?"[146] Again, it is interesting to note that the concerns that existed at the time of the negotiation of the Outer Space Treaty are still present today.

According to Hobe,[147] the US and USSR proposals were restricted to national claims of sovereignty. The Antarctic Treaty influenced the US proposal. The British representative also supported the anti-sovereignty principle. The drafters wanted more than just the prohibition of public law titles in space. For the Austrian representative, the purpose of article II was to regulate the exploration and use of space so as to avoid any contradiction between non-appropriation and use. For Belgium, the non-appropriation was to include both public and private actors in space. France shared this position. The USSR was of the opinion that it was unwise to look too far, and that there was no need to establish rules for future situations that could not clearly be foreseen.

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[145] *Moon Agreement*, *supra* note 2 art 11(2).
[146] UNCOPUOS, Legal Sub-Committee, Fifth Session, *Summary Record of the 64th Meeting of the Legal Sub-Committee*.
[147] Hobe, *supra* note 73.

In its conclusion, the Belgian delegation[148] stated that the "interpretation of the term 'non-appropriation' advanced by several delegations – apparently without contradiction – as covering the establishment of sovereignty and the creation of titles to property in private law." But many other delegations did not want to set up a precise regime to curtail the right of states to use the resources of space. This is why the question remains open today. In the words of USSR delegate Morozov,[149] "No human activity on the Moon or any other celestial body could be taken as justification for national appropriation…." The US delegation affirmed this position stating: "We have rejected the concept of national sovereignty in outer space. No Moon, no planet shall ever fly a single nation's flag."[150] The fact that the principle of non-appropriation prohibits the exercise of both public and private titles in space does not prevent the exploitation of space resources. Considering the political context at the time the Moon Agreement was adopted, it is fully understandable that a detailed regime could not be set up.

1.2 APPLICABILITY

It is difficult to determine what is covered by the non-appropriation principle. What is clear is that complete freedom of use is not possible - "use" is permitted whereas "appropriation by use" is not. On the basis of article II of the Outer Space Treaty, while appropriation by means of public titles is prohibited, some authors consider that it is allowed by way of private titles. This issue has been hotly debated in the space law community. In the opinion of Hobe,[151] States, non-governmental entities and international intergovernmental organisations are allowed to use outer space and celestial bodies for commercial purposes, including the extraction of minerals and other resources, subject to important limitations such as that provided for in article II of the Outer Space Treaty. For Hobe, article II of the Outer Space Treaty covers both public and private titles, the latter being specifically included by the expression "by any other means." At the opposite end

[148] Draft Treaty Governing the Exploration of the Moon and Other Celestial Bodies, U.N. A/AC.105/C.2/L.12., USA Proposal, 17 June 1966. Reproduced in A/AC.105/32. OOSA online: < http://www.oosa.unvienna.org/pdf/reports/ac105/AC105_032_and_AC105_032corr1E.pdf>. (date accessed: March 13, 2012).
[149] Hobe, *supra* note 73.
[150] *Ibid*.
[151] *Ibid*.

of the spectrum, Lee and Eylward[152] consider that since in the Chinese text of the treaty, the term "national appropriation" would only mean appropriation by or for the State itself, private appropriation is not included within the scope of article II. It is important to note, that the Chinese text is the only version of the five official languages of the treaty that is amenable to such an interpretation. The opinion of Lee and Eylward is supported by Gorove[153] who argues that private entities are not included in the prohibition. In any event, Hobe disagrees and his views on the matter are supported by Tennen.[154]

1.3 NON-APPROPRIATION IN AN INTERNATIONAL AREA DOES NOT AMOUNT TO ABSENCE OF SOVEREIGNTY

The non-appropriation principle is unique to space law – it is neither found in the 1982 United Nations Law of the Sea Convention nor in the 1959 Antarctic Treaty. Its ultimate objective is to ensure the use of outer space as a *res communis*. In space, there is room for the exercise of authority, jurisdiction, use or occupation as long as the activity does not amount to national appropriation. In this regard, Gorove[155] is of the view that temporary use of resources without transformation or deterioration is allowed while consumption or destruction is not. In his view,[156] the Outer Space Treaty does not completely prohibit the exercise of sovereignty in space – the concept of international responsibility for national space activities is linked to the existence of sovereign rights.

1.4 THE NON-APPROPRIATION PRINCIPLE COHABITS WITH THE EXERCISE OF JURISDICTION IN SPACE

While the non-appropriation principle is a key element of the Outer Space Treaty, it cohabits with other provisions on the exercise of jurisdiction and control in space. On

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[152] R Lee & F Eylward, "Article II of the Outer Space Treaty and Human Presence on Celestial Bodies: Prohibition of State Sovereignty, Exclusive Property Rights, or Both?" in *Proceedings of the 48th Colloquium on the Law of Outer Space* (Herndon, VA: IISL/AIAA, 2005).
[153] Stephen Gorove, "Interpreting Article II of the Outer Space Treaty" in *Proceedings of the 11th Colloquium on the Law of Outer Space* (Herndon, VA: AIAA/IISL, 1968) 40-45 [Gorove, Interpreting Article II of the OST].
[154] Leslie Tennen, "Article 2 of the Outer Space Treaty, the Status of the Moon and Resulting Issues" in *Proceedings of the 47th Colloquium on the Law of Outer Space* (Herndon, VA: AIAA/IISL, 2004) 5-14.
[155] Gorove, Interpreting Article II of the OST, *supra* note 153 at 40-45.
[156] Stephen Gorove, "The Future of Space Law: A Legal Regime for Space Colonies" in *Proceedings of the 19th Colloquium on the Law of Outer Space* (Herndon, VA: AIAA/IISL, 1976) at 47-51 [Gorove, The Future of Space Law].

the basis of article VIII[157] of the Outer Space Treaty, states must exercise jurisdiction and control over their space objects in outer space. Since there cannot be sovereignty in outer space, this provision creates an artificial link between states and their space objects, thereby allowing the extension of the application of national laws into space, without creating any territorial extensions. Article VIII of the Outer Space Treaty, therefore, permits states to exercise jurisdiction in space - an international area. Article 12 of the Moon Agreement also dealing with jurisdiction and control is similar to article VIII of the Outer Space Treaty. It provides: "States Parties shall retain jurisdiction and control over their personnel, vehicles, equipment, facilities, stations and installations on the moon. The ownership of space vehicles, equipment, facilities, stations and installations shall not be affected by their presence on the moon."

Jurisdiction in outer space includes the exercise of judicial, executive and legislative powers. Determining the issue of jurisdiction becomes complex where there are several countries jointly carrying out activities in outer space, including on the Moon and on other celestial bodies. Each of them may exercise jurisdiction over the space station so established. In such cases, there will probably be the need to supplement the jurisdiction based on registration of objects on the Moon and Mars by some more specific provisions relating to personal jurisdiction and some form of agreement will have to be reached between the states jointly conducting the activity.[158] The International Space Station (ISS) project provides an excellent practical example of the foregoing. An Intergovernmental Agreement (IGA) governing the International Space Station[159] was concluded and executed by the participating states in 1998.

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[157] *Outer Space Treaty*, *supra* note 1 art VIII states: "A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body."

[158] Jan Ondrej, "Problems of jurisdiction in connection with settlements of the Moon and Mars" in *Proceedings of the 34th Colloquium on the Law of Outer Space* (Herndon, VA: AIAA/IISL, 1991) 71.

[159] Art V of the International Space Station Intergovernmental agreement: "Each Partner shall retain jurisdiction and control over the elements it registers and over the personnel in or on the space station who are its nationals". Agreement Between The United States of America and Other Governments, Signed at Washington January 29, 1998 with Annex and Arrangement Between The United States of America and Other Governments Signed at Washington January 29, 1998. Treaties and Other International Acts Series 12927. State Government online: < http://www.state.gov/documents/organization/107683.pdf>. (date accessed: March 13, 2012).

Article VIII of the Outer Space Treaty distinguishes between the exercise of jurisdiction and control over space objects and the element of state ownership of objects launched in outer space and those built on celestial bodies. Ownership of space objects is not affected by their presence in space. If such structures are constructed in space in the context of international collaborative projects, there will be the need to respect the reciprocity principle, free access and non-appropriation, which may lead to difficulties. It will all depend on how the treaty provisions are observed. In Bhatt's opinion,[160] it is important that the global community interest takes precedence over those of individual states. It will be necessary for lawyers to be creative and the IGA may be a source of inspiration. The issue of jurisdiction is important considering the international liability mechanisms contained in the Outer Space Treaty.[161]

The non-appropriation principle has been given several interpretations. It is instructive to review some of these interpretations in order to better comprehend the challenges that it poses to the exploitation of space natural resources.

1.5 SCOPE OF THE NON-APPROPRIATION PRINCIPLE

1.5.1 CASUAL OR TEMPORARY USE

Gorove considers that "an individual acting on … [his or her] own behalf or on behalf of another individual or a private association or an international organization could lawfully appropriate any part of outer space, including the moon and other celestial bodies" while "political subdivisions of a state (states of a federal state, cities or municipalities) may not appropriate under a strict interpretation."[162] He makes a distinction between permanent and temporary use of property:[163] in the former case, a permanent settlement on a celestial body would, for example, amount to appropriation in his view. In the latter case, a temporary use of property would not constitute appropriation. According to Gorove, "[t]o constitute appropriation, the acquisition must

[160] Bhatt, *supra* note 11.
[161] *Outer Space Treaty*, *supra* note 1 art VI: States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.
[162] Gorove, Interpreting Article II of the OST, *supra* note 153.
[163] *Ibid*, at 359-354.

be carried out for the purpose of one's own exclusive use."[164] It is the "taking of property for one's own or exclusive use with a sense of permanence." In this case, commercial activities carried out on a celestial body by nationals of a country would amount to national appropriation if the activity is conducted under the supreme authority of the state. In his opinion, "appropriation" is more than just "actual use." Accordingly, temporary use does not amount to appropriation.

Gorove's analysis is questionable since the drafters of the Outer Space Treaty clearly did not intend to associate appropriation of space with the duration of the use. Moreover, a practical difficulty arising from this analysis relates to the characterization of space activities as temporary or permanent. Even with today's advanced technology, it is impossible to support a mission in space for an infinite period of time. As such the question of where to draw the line between permanent and temporary use is difficult if not impossible to answer. The situation gets even more complicated in cases where space natural resources are extracted and used, albeit within a short period of time.

Vereshchetin[165] considers appropriation as amounting to the voluntary taking of "something into one's property". In his view, article II of the Outer Space Treaty "definitely and unequivocally" establishes that the Moon and other celestial bodies are not subject to national appropriation. For the Soviets, portions of the surface or subsurface of the Moon and other celestial bodies cannot be the subject of a legal transaction. In Brooks' opinion, all forms national appropriation are prohibited, however, several claims are distinguished: claims by means of sovereignty; claims by means of use or occupation. In his view, means of use may include effective possession over a long period of time. It may also include the theory of consolidation of historic titles: a territory or expanse of sea is attached to a given state and differs from occupation in that it can apply to certain parts of the sea as well as land. "Occupation" does not support national appropriation. Finally, the prohibition applies to claims by any other means - "whatever residue of international law applies to national appropriation, and has no limitation."[166]

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[164] *Ibid*.
[165] Vladen S. Vereshchetin: "on The Principle of State Sovereignty in International Space Law," Annals of Air and Space Law, 1977, vol II, 429-36.
[166] Brooke, *supra* note 75.

Based on the views expressed by these authors, it would appear that the preferred means of appropriation, which accords with the practical reality, is permanent use of a portion of space in the sense that it cannot thereafter be used by anybody else.

1.5.2 PROHIBITION BASED ON THE TYPE OF RESOURCES, THEIR LOCATION OR AVAILABILITY

For some authors,[167] the non-appropriation principle is only applicable to exhaustible resources. Under this view, since the non-appropriation principle applies to portions of space and not the resources found therein, extraction of those resources is not illegal. On the contrary, some authors believe that the prohibition of national appropriation of space extends to the resources of space irrespective of their location. For Gorove,[168] national appropriation of elements of outer space that have reached the Earth as a result of natural causes is not prohibited. However, if the elements have been brought back by human intervention, this would constitute appropriation. Regarding resources that are brought back to Earth and used for commercial, profit-seeking purposes, it is difficult to determine whether there has been compliance with, for instance, article II of the Outer Space Treaty. For Vasilevskaya, it is necessary to take into account goodwill and international cooperation.[169]

Under a classification based on the availability of resources, some authors consider that it is not realistic to talk about appropriation of space resources such as cosmic rays or gases that are available in large quantities.[170] For Brooks,[171] the non-appropriation problem (and the article IX duty of international consultations) only arises when a state uses scarce resources. A state is not limited in using space resources when the resources in question are not diminished by such use (e.g., electromagnetic radiation). However, a state may not use resources when the quantity of the resources is diminished by the use, unless it confers an appropriate benefit on the community of nations. Here, the benefit clause plays a role in determining the extent to which finite resources may be used

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[167] Gorove, The Future of Space Law, *supra* note 156.
[168] *Ibid*. See also Gorove, Interpreting Article II of the OST, *supra* note 153.
[169] EG Vasilevskaya, "Notions of 'Exploration' and 'use' of Natural Resources of Celestial Bodies" in *Proceedings of the 20th Colloquium on the Law of Outer Space* (Herndon, VA: AIAA/IISL, 1977) 473. [Vasilevskaya].
[170] Gorove, Interpreting Article II of the OST, *supra* note 153.
[171] Brooke, *supra* note 75.

by any one state. The state shall receive appropriation compensation (e.g., its share of the resource). This approach is interesting although hard to implement.

A distinction could also be made on the basis of the type of appropriation, whether the appropriation is for scientific purposes or otherwise (article 1(3) of the Moon Agreement). For Gorove, the Outer Space Treaty does not prohibit appropriation driven by scientific purposes.[172] A minimum of "national appropriation" is created with scientific testing.[173] "Since the use of planetary resources is permitted but national appropriation is not, there is a point at which the use of planetary resources becomes appropriation and is forbidden. This point depends on the magnitude of the use and the nature of the resource."[174]

Most activities are conducted so as to prevent any national appropriation of outer space, the Moon and other celestial bodies. Even during the Cold War, the implantation of the US flag on the Moon was preceded by a statement of the United States in which they denied any appropriation of the Moon: "this act is intended as a symbolic gesture of national pride in achievement and is not to be construed as a declaration of national appropriation by claim of sovereignty."[175]

For space natural resources, the practical consequences of the foregoing discussion are that a State may use the resources of a celestial body for scientific purposes (article 1(3) on freedom of scientific investigation), subject to the obligation to respect article IX and inform the UN Secretary General and the global scientific community. A State may also use space natural resources to support its space mission. However, this use may not exceed what is deemed necessary for the mission.

Opinions differ as to whether or not article II of the Outer Space Treaty permits the appropriation of space natural resources. According to Hobe, the fact that there is no reference to the extraction of natural resources in article II means that it is not prohibited.

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[172] Gorove, Interpreting Article II of the OST, *supra* note 153.
[173] Brooke, *supra* note 75.
[174] *Ibid*, at 346.
[175] For a discussion of the political context surrounding the implantation of the US flag on the Moon, see Anne M Platoff, "Where No Flag Has Gone Before: Political and Technical Aspects of Placing a Flag on the Moon" online: NASA <http://www.jsc.nasa.gov/history/flag/flag.htm#FN17> (date accessed: March 13, 2012).

It is more or less a matter for article 1(1) to limit possible uses of space in order to qualitatively allow all States to benefit therefrom. Since the Moon Agreement foresees the need to establish an international legal regime to govern the exploitation of resources, this means that 1967 Outer Space Treaty does not prohibit the exploitation of space natural resources. For Brooks,[176] however, the taking of resources falls within the article II prohibition. Is it the prohibition limited to the territory or does it also include a prohibition on the resources? The Outer Space Treaty does not provide indications. The Antarctic Treaty mentions territorial sovereignty, but not the resources. The analysis needs to couple the Outer Space Treaty art II and art I to see whether the resources were included in the prohibition: free right of outer space use by States in respect of the benefit clause, as well as respect of the non-appropriation principle. For Brooks, the paradox cannot be solved by resorting to the legislative history or the declarations after the Outer Space Treaty. For Hobe[177] negotiation history suggests that any private title to property equivalent to national appropriation by claims of sovereignty or use should be prohibited.

The position adopted by the French during the Outer Space Treaty negotiations expresses in few words the difficulties raised by the Treaty, which is also part of its richness "the Subcommittee would have to decide how far the principle of non-appropriation was compatible with effective exploration and exploitation, for the same resolutions that forbade the appropriation of celestial bodies encouraged their use." Considering the importance of such provision and the impact of its implementation, for the Mexican representative, "it was essential to indicate exactly where outer space began."[178]

Under the Outer Space Treaty, the exploration and use of outer space shall be conducted for the benefit of all mankind. This is the spirit in which the Moon Agreement was concluded. The extraction of space natural resources can happen since there is no explicit prohibition against it. Does it follow then, as concluded by Hobe, that the appropriation of space natural resources is legal? For him, the limit is article 1(1), the preservation of outer space and celestial bodies for all mankind. Since the regime

[176] Brooke, *supra* note 75.
[177] Hobe, *supra* note 73.
[178] *Summary Record of the 71st Meeting of the Fifth Session of UNCOPUOS Legal Sub-Committee*, *supra* note 111 at 20.

foreseen in article 11(7) of the Moon Agreement has not been established as yet, there is no possibility to define limits applicable to the extraction and appropriation of space natural resources.

In relation to the Outer Space Treaty, a reasonable statement was made by the Soviet representative during the negotiations: "[A] treaty could deal only with problems arising at the current stage of human evolution, and future developments would arise to new problems requiring subsequent solutions. But it would be unwise to look too far ahead and to attempt to prescribe rules for situations on which it was impossible to form adequate judgement at the present stage."[179] The Chairman's statement made at the end of the negotiations illuminates us about the manner in which the negotiators built international space law: "the wise course would be to aim at the gradual development of legal principles and their later incorporation in Treaties; meanwhile, specific practical problems would be dealt with in specific agreements. Outer space would thus develop in two ways: from general principles to detailed arrangements and vice versa."[180]

The Moon Agreement also contains some interesting provisions.

1.6 NON-APPROPRIATION AND THE MOON AGREEMENT

A Latin expression coming from Roam law makes a distinction between *res nullius* belonging to no one and which can be appropriated and *res communis* belonging to all where no occupation or appropriation is possible. With regard to *res extra commercium*, no transfer or appropriation is possible. The term is used in connection with the legal status of the Moon under article II of the Outer Space Treaty since the Moon and celestial bodies cannot be the subject of national appropriation.[181] The Moon Agreement art 11(3) constitutes an extension of the Outer Space Treaty and a clear added value. This provision states that "3. Neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall become property of any State, international

[179] UNCOPUOS, Legal Sub-Committee, Fifth Session, *Summary Record of the 63rd Meeting*, UN Doc A/AC.105/C.2/SR.63 at 11.
[180] *Summary Record of the 71st Meeting of the Fifth Session of UNCOPUOS Legal Sub-Committee*, *supra* note 111 at 25.
[181] *International Cooperation in the Peaceful Uses of Outer Space*, GA Res 1721(XVI), UNGAOR, 16th Sess, Supp No 17 (1961) [*GA Res 1721(XVI)*]. See also *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space* GA Res 1962(XVIII), UNGAOR, 18th Sess, Supp No 15 (1963).

intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person. The placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface of the Moon, including structures connected with its surface or subsurface, shall not create a right of ownership over the surface or the subsurface of the Moon or any areas thereof. The foregoing provisions are without prejudice to the international regime referred to in paragraph 5 of this article."

The Moon Agreement makes a distinction between the resources in place, where the prohibition applies, and those that have been removed for scientific investigation purposes, in respect of which property rights are permitted. According to Galloway, the distinction between the place of origin of space natural resources and their disposal thereafter was introduced at an early stage in the discussions of the Legal Sub-Committee of COPUOS. Before being removed, the natural resources cannot be made public or private property.[182] In Hobe's opinion, these provisions suggest that any removal of resources from the Moon or other celestial bodies may make them subject to the usage regime indicated in article 11(7) of the Moon Agreement. If it calls for the establishment of an international regime in 1979, it means that States Parties were not convinced that no such prohibition was already incorporated in the law in 1967. For Hobe, no such moratorium was previously considered to exist under the Outer Space Treaty.

According to Jakhu,[183] both private and public entities are entitled to collect and remove the Moon's minerals and other substances for purposes of scientific investigation. The Moon Agreement goes further and, in this regard, is very different from the provisions of article II of the Outer Space Treaty. Since it is later in time, the provisions of the Moon Agreement should prevail in Jakhu's view. However, considering its lack of ratification, the whole issue concerning the legal value of the Moon Agreement remains.

If the exploitation of space natural resources is to happen, it will be necessary to take into account past and current concerns about the above-mentioned questions. A good

[182] *Galloway Report*, *supra* note 18. See also Hobe *supra* note 73.
[183] Jakhu, *supra* note 43.

balance will be needed between developing countries, developed countries and space entrepreneurs.

The protective provisions of the Moon Agreement are a major element of the future regime on space exploration. The same article foresees the establishment of an international regime to govern resources exploitation while at the same time prohibiting any appropriation. The co-existence of a non-appropriation principle and rules governing the exploitation of space natural resources will not be contradictory. It is even a requirement to secure the future use of outer space and the proper development of the exploitation of space resources. As in other international areas, legal mechanisms need to be established. The provisions contained in article 11(3) of the Moon Agreement need to be maintained in the future regime that would be applicable to space natural resources, except those removed for scientific investigation and to which article 6(2) applies. Those resources remain at the disposal of the states.

2. THE COMMON HERITAGE OF MANKIND DOES NOT PREVENT FURTHER COMMERCIAL ACTIVITIES ON THE MOON

2.1 HISTORICAL CONTEXT

The Common Heritage of Mankind is a fundamental concept of space law and it is especially relevant in the context of the exploitation of space natural resources. The concept first appears in article 4(1) of the Moon Agreement, which, in essence, is a repetition of article I of the Outer Space Treaty.[184]

The most discussed, misinterpreted and misunderstood provision of the Moon Agreement is its article 11. For the first time, article 11 introduced the notion of Common Heritage of Mankind into international space law and this was closely linked to the introduction of the same concept in the elaboration of the Law of the Sea. Article 11(1) states: "The moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of this article." The Common heritage of mankind is not defined and this issue has raised concern from the very beginning. Before addressing the compatibility of the common

[184] See *supra* under III.

heritage of mankind concept to space natural resources exploitation, it is instructive to look briefly at the historical origin and development of the concept.

The concept was first proposed in August 1967. The Ambassador of Malta suggested that the resources of the ocean should be considered "the Common Heritage of Mankind" and used for the benefit of mankind. The negotiation of the Moon Agreement included a succession of draft proposals starting with Argentina in 1970. On July 3, 1970, Argentina proposed that the application of the Common Heritage of Mankind principle should be extended to space natural resources.[185] Argentina considered that use of space natural resources had already begun, and that: "the legal system applicable to natural resources used in their place of origin shall be distinct from that applicable to those brought to the Earth for use […] the benefits obtained from the use of the natural resources […] shall be made available to all people without discrimination of any kind […] distribution of benefits shall be made with due regard for promoting 'higher standards of living and conditions of economic and social progress and development, pursuant to article 55a of the Charter of the United Nations'."[186] Following the Argentinean proposal in 1970, the USSR issued a draft on June 4, 1971 that covered fewer issues and did not address the Common Heritage of Mankind or the question of an international regime to govern the exploitation of space natural resources. These questions were discussed in 1972, in parallel with the Law of the Sea Convention.

The Declaration of Principles Governing the Seabed and the Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction was adopted by the United Nations General Assembly on December 1970. It includes similar principles as the Outer Space Treaty on issues of peaceful use and denial of claims of sovereignty. Further, the Declaration states: "beyond the limits of national jurisdiction, the sea-bed and ocean floor and the subsoil are the Common Heritage of Mankind".[187]

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[185] *Galloway Report*, *supra* note 18 at 7.
[186] Report of the Legal Sub-Committee on the Work of its 11th session, UN Doc A/AC.105/101. (May 11, 1972), Annex I, pp 6-7.
[187] *Declaration of Principles Governing the Seabed and the Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction*, GA Res 2749(XXV), UNGAOR, 25th Sess, Supp No 28, UN Doc A/RES/2749(XXV) (1970). *Galloway Report*, *supra* note 18 at 8.

Between 1972 and 1973, a draft text for the Moon Agreement was prepared on the basis of a large number of working papers. One US document included the Argentinean proposal on Common Heritage of Mankind.[188] However, the USSR objected to the inclusion of the concept until a final compromise was reached in 1979. For the Soviets, the term "heritage" is not a legal term but a philosophical one. In the absence of property rights on the Moon, it has no meaning. Instead, the USSR preferred[189] the concept of "Province of all mankind" as already mentioned in article I of the Outer Space Treaty.[190] In a 1972 working paper, Argentina stated that Common Heritage of Mankind is a "more meaningful expression" than "Province of all mankind". Considering the difference of views, Austria made a proposal in 1978 to reconcile the different views.[191] In 1979, the Austrian text was amended by Brazil as follows "the moon and its natural resources *are* the common heritage of mankind, which finds its expression in the provisions of this Agreement and in particular in paragraph 5 of this article."[192] This was finally accepted by the USSR.

Considering this evolution, developing countries like Argentina or Brazil did not insist on a moratorium on exploiting the natural resources. Other amendments to the Austrian text were recorded by COPUOS as "understandings"[193] to clarify provisions in the final draft. At this stage of the treaty negotiation, to reopen the whole debate would have led to a failure of consensus. This is why this procedure was chosen:

- Article I paragraph 1, the principle contained in article XI paragraph 1 would also apply to celestial bodies in the solar system other than the Earth and to its natural resources.
- Article I paragraph 2 was clarified by agreement that the trajectories and orbits mentioned in article I paragraph 2 do not include trajectories and orbits of space

[188] UNCOPUOS, Legal Sub-Committee, Sixth Session, *Draft Treaty Governing the Exploration of the Moon and Other Celestial Bodies*, (Working Paper No. 12 presented by the US) UN Doc A/AC.105/C.2(XI).
[189] On the USSR position and the Common Heritage of Mankind, see A/AC.105/115. April 27, 1973.
[190] See *Supra* under III.
[191] Working Paper submitted by Argentina to the UNCOPUOS, U.N. Doc. 105/196 (April 11, 1977) (Annex I).
[192] UNCOPUOS. Report of the Legal Sub-Committee on the Work of its Eighteenth Session (Mar. 12-Apr. 6, 1979), A/AC.105/240, Apr. 10, 1979. Annex III, p.2.
[193] UNCOPUOS. Report of the Committee on the Peaceful Uses of Outer Space, General Assembly Official Records, Thirty-fourth Session, Supplement No. 20 (A/34/20), 1979, pp. 10-12. OOSA website, online: <http://www.oosa.unvienna.org/pdf/gadocs/A_34_20E.pdf> A/RES/34/20 – Third United Nations Conference on the Law of the Sea.

objects in Earth orbits only and trajectories of space objects between the Earth and such orbits.

- Article VII is not intended to result in prohibiting the exploitation of natural resources which may be found on celestial bodies other than the Earth but, rather, that exploitation will be carried out in such a manner as to minimize any disruption of adverse effects to the existing balance of the environment.

An appreciation of the legal value of the "understandings" is important to understanding the current regime applicable to space natural resources since it is not intended to prohibit the exploitation of the resources. We also know from the *Travaux Preparatoires* that, at the beginning of the discussion, developing countries wished to have a moratorium placed on the exploitation of space natural resources and that this was abandoned in 1979 in order to facilitate the achievement of consensus on the final draft. In his address to the Special Political Committee on November 1, 1979, the day preceding the adoption of the final text of the Moon Agreement, Ambassador Richard W Petree, Deputy US Representative to the UN Security Council, stated that: "for purposes of the Moon Treaty, [the meaning of the common heritage of mankind principle] is to be found within the Moon Treaty itself, […] without prejudice to its use or meaning in any other Treaty."[194]

Galloway underlines that the Common Heritage of Mankind is added to the "province of all mankind" of the Outer Space Treaty art I and the Moon Agreement art 4. "The Common heritage of mankind is probably an extension of province because it is connected with the possible establishment of an international regime concerned with natural resources but not otherwise with the Moon." Despite the historical context, the compromise brokered by the Austrian text as amended by Brazil and the understandings recorded by COPUOS, the Common Heritage of Mankind concept has been given different interpretations by authors. For Gorove, the Common Heritage of Mankind may constitute an obstacle to the establishment of a space colony.[195] In his view, it would seem that the concept imposes a ban on any transfer of space natural resources onto the Earth by any country for its own exclusive economic benefit and that such transfer will be permitted once an appropriate international regime has been established.

[194] Galloway Report, *supra* note 18 at 43.
[195] Gorove, The Future of Space Law, *supra* note 156.

The Common Heritage of Mankind concept should be interpreted with greater flexibility and be analysed distinctly from the sharing of benefits principle. As stressed by Jakhu, an "equitable" and not an "equal" sharing of the benefits is required, and until the new regime on space natural resources is adopted, private entities do not have to share the benefits of such exploration.[196] "The Common Heritage of Mankind is an evolving principle and not one that is/would be frozen in time."[197] On the basis of this argument, one can propose a specific interpretation when the exploitation of the space natural resources occurs or is about to occur. The notion of Common Heritage of Mankind may also be interpreted as an extension of the "province of all mankind" as mentioned in the Outer Space Treaty.[198] The Common Heritage of Mankind is a social and political ideal; it does not contain any binding obligation.[199] "The Common Heritage doctrine itself is without legal context."[200] For Rosenfield, the fact that there is no intention to broaden the Common Heritage doctrine in the Moon Agreement shows it has no legal authority. This latter interpretation seems a bit far-fetched in claiming that the Common Heritage of Mankind concept has no legal authority. However, it is clear that the concept is part of the political ideals that informed the spirit in which the existing international space law treaties were adopted.

For the above-mentioned reasons, it is believed that the Common Heritage of Mankind concept should not be considered as a barrier to the future potential use and exploitation of space natural resources. However, clarification is required. The need for clarification was recalled by some delegations during the 2009 session of the COPUOS Legal Subcommittee.[201] The Common Heritage of Mankind is a non-binding political principle encouraging States to behave in a certain manner, in the spirit of international space law. The principle does not prevent commercial activities in space, and would not

[196] Jakhu, *supra* note 43.
[197] *Ibid*.
[198] Galloway Article, *supra* note 25.
[199] Rosenfield, Article XI of the Draft Moon Agreement, *supra* note 40.
[200] *Ibid.*
[201] Some delegations expressed the view that there were certain inconsistencies between the principle of "common heritage of mankind" expressed in article 11 of the Moon Agreement and the principle of "province of all mankind" enshrined in article I of the Outer Space Treaty and expressed the need for a clarification of those principles. See UNCOPUOS, *Report of the Legal Subcommittee on its forty-eighth session, held in Vienna from 23 March to 3 April 2009*, UN Doc A/AC.105/935, online: UN Office of Outer Space Affairs <http://www.oosa.unvienna.org/pdf/reports/ac105/AC105_935E.pdf> (date accessed: March 13, 2012).

prevent the exploitation of space natural resources. With the new trend in the development of space activities, it is important to realize that the concept is compatible with the elaboration of a dedicated regime to govern the exploitation of space natural resources. The joint statement made at the 2008 session of the COPUOS Legal Subcommittee reaffirmed this fact in the following words:

> The Moon Agreement does not preclude any modality of exploitation, by public or private entities, or prohibit the commercialization of such resources, provided that such exploitation is compatible with the principle of a common heritage of mankind.[202]

2.2 COMMON HERITAGE OF MANKIND AND COMMON BUT DIFFERENTIATED RESPONSIBILITY

Other developments in international law, like the common but differentiated principle, are more visible in other area such as environment law deserves particular attention as they are directly linked to the topic.

Common but differentiated responsibility: key principles

Principle 7 of the Rio Declaration of 1992[203] introduces the principle of common but differentiated responsibility: States shall cooperate in a spirit of global partnership to conserve, protect and restore the health and integrity of the Earth's ecosystem. In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit to sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.

The Rio Summit's important outcome was the United Nations Framework Convention on Climate Change, a resolution adopted by the General Assembly on 20

[202] *Joint Statement*, *supra* note 3 at 5.
[203] United Nations, *Rio Declaration on Environment and Development*, UN Doc. A/CONF.151/26 (vol. I) / 31 ILM 874 (1992). Online UNEP: <http://www.unep.org/Documents/Default.asp?DocumentID=78&ArticleID=1163> (date accessed: March 13, 2013).

January 1994 (UNFCCC)[204]. The Convention's objective is to "achieve (…) stabilization of greenhouse gas concentrations in the atmosphere (…)."[205] The Convention provides additional obligations for a list of developed countries.[206] In this Convention the principle of the common but differentiated responsibility is stated in the Preamble and commitments by States Parties are made on this basis.

A few years later, States Parties to the UNFCC Convention have adopted in Kyoto, Japan, on 11 December 1997 the Kyoto Protocol to the United Nations Framework on Climate Change[207] to limit green house gases and reinforce the measures against climate change. It entered into force on 16 February 2005. The Protocol confirms the responsibility of the developed countries and requires them to reduce "their overall emissions by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012."[208] The importance of the text resides in the fact that it defines internationally binding commitments to reduce emissions. This text has not been ratified by the United States.

The New Delhi Declaration of Principles of International Law relating to Sustainable development[209] was drafted at the 70th Conference of the International Law Association, held in New Delhi, India, 2-6 April 2002. The text was elaborated after years of research; it defines fundamental objectives of international law related to sustainable development, among them, the principle of common but differentiated responsibility. It states the fact that "developed countries bear a special burden of responsibility[210] (…)" while "the special needs and interests of developing countries and of countries with economies in transition, with particular regard to least developed countries and those

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[204] UN General Assembly, *United Nations Framework Convention on Climate Change: resolution adopted by the General Assembly*, 20 January 1994, A/RES/48/189, online: UNHCR < http://www.unhcr.org/refworld/docid/3b00f2770.html > (date accessed: March 13, 2013).
[205] Supra note 203 art 2 [UNFCC]
[206] Supra note 203 art 4 [UNFCC] and in Annex 1 the list of developed countries
[207] Kyoto Protocol to the United Nations Framework on Climate Change, UN Doc FCCC/CP/1997/7/Add.1, Dec. 10, 1997; 37 ILM 22 (1998)
[208] *Ibid* art 3 [Kyoto Protocol]
[209] International Law Association Resolution 3/2002: New Dehli Declaration of Principles of International Law relating to Sustainable development, in ILA, Report of the Seventieth Conference, New Delhi (London, ILA/2002), online ILA: <http://www.ila-hq.org> (date accessed: March 13, 2013). [*ILA resolution*]
[210] *ILA Resolution* Supra note 209, art 3.4.

affected adversely by environmental, social and developmental considerations, should be recognized."[211]

At the end of the 2012 milestone, on 8 December 2012 in Doha, the Amendment to the Kyoto Protocol[212] was adopted. It includes new commitments for the Kyoto Protocol States Parties from 1 January 2013 until 31 December 2020. It also contains a revised list of greenhouse gases but has not entered into force yet.

Common but differentiated responsibility: impact for the study

The objective of this international law principle was to define a difference of obligations between the countries which have largely contributed to cause damage to the climate while developing countries contribution to the climate disruption came several years later.

What was considered as a fair principle to establish equity in the responsibilities regarding climate change became a brake for further action[213]. The difference of treatment in the international agreements between a developed and a developing country was not accepted by the whole community. For example, Robert Gibson recalls the fact that the disagreement of the United States to ratify the Kyoto Protocol was linked to the fact that it would create competitive distortions between them[214]. International competition interest clearly prevails on the sustainable developments issues.

A very limited number of countries have the capacity to conduct activities in space today, and the exploitation of space natural resources will be possible for an even smaller number of countries. In this regard, the idea of having common but differentiated responsibilities on the basis of the development of the country was already taken into account in international space law. In several provisions of international space law, the distinction was made between the developed and the developing countries to ensure the

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[211] *ILA Resolution* Supra note 209, art 3.3.
[212] Doha amendment to the Kyoto Protocol to the United Nations Framework Convention on Climate Change, 8 december 2012, C.N.718.2012.TREATIES-XXV II.7.c.
[213] Robert Gibson, "Common but Differentiated Responsibility at Rio+20", Outreach Magazine, 23 April 2012, p. 4, online: <http://www.stakeholderforum.org/sf/outreach/index.php/inf2day1home/729-inf2day1item4> (date accessed: March 13, 2013).
[214] *Ibid* [Gibson]

former would not act in such a way that would be detrimental to the latter, not yet conducting space activities.

Art 1 of the Outer Space Treaty dealing with the benefit clause is of particular relevance as already analyzed.[215] The provision, without specifying developed and developing countries, underlines international law equity in the exploration and use of outer space. The provision highlights this should be done "irrespective of their degree of economic or scientific development". The importance to take into account countries which have not yet the space capacity is part of the Outer Space Treaty provisions and spirit. The special needs of developing countries and the geographical situation of particular countries are specifically taken into account in Art 44 of the International Telecommunication Union Constitution.[216] The 1974 Convention relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite[217] contains obligations upon contracting states related to programme-carrying signal distribution. The convention also provides specific measures when the programme "is solely for the

[215] *Supra* note 59. Article 1 states: "The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind. Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies. There shall be freedom of scientific investigation in outer space, including the Moon and other celestial bodies, and States shall facilitate and encourage international cooperation in such investigation."

[216] Article 44: Use of the Radio-Frequency Spectrum and of the Geostationary-Satellite and Other Satellite Orbits. In using frequency bands for radio services, Member States shall bear in mind that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries. ITU Constitution, ITU online: < http://www.itu.int/net/about/basic-texts/constitution/chaptervii.aspx> (date accessed: March 26, 2013).

[217] Convention relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite, 1974, art 4 (ii) states "No Contracting State shall be required to apply the measures referred to in Article 2 (1) where the signal distributed on its territory by a distributor for whom the emitted signal is not intended (…) carries, as quotations, short excerpts of the programme carried by the emitted signal, provided that such quotations are compatible with fair practice and are justified by the informatory purpose of such quotations, or carries, where the said territory is that of a Contracting State regarded as a developing country in conformity with the established practice of the General Assembly of the United Nations, a programme carried by the emitted signal, provided that the distribution is solely for the purpose of teaching, including teaching in the framework of adult education, or scientific research." 1144 U.N.T.S. 3; 13 ILM 1444 (1974); ATS 1990 No. 30. UNESCO online, <http://portal.unesco.org/en/ev.php-URL_ID=13636&URL_DO=DO_TOPIC&URL_SECTION=201.html>, (date accessed: March 26, 2013).

purpose of teaching (…) or scientific research" in a contracted state considered as a developing country.

The United Nations 1986 Principles relating to remote sensing of the Earth from space state the need to take into account the needs of developing countries. It is stated under the provision relating to the right of the sensed State to have access to primary and processed data concerning the territory under its jurisdiction as soon as the data are produced.[218] In the 1979 Moon Agreement, the interest of developing countries is taken into account when dealing with the equitable sharing of the resources.[219] It means that there is a responsibility for the developed countries to share the benefits coming from the resources.

It appeared also more recently in the space debris mitigation guidelines of the Committee on the Peaceful uses of Outer Space. The space debris mitigation guidelines include several measures, notably to limit debris released during normal operations, minimize the potential for break-ups during operational phases or the probability of accidental collision in orbit[220]. The implementation of the measures is made on a voluntary basis, via national mechanisms. It is important to note that the guidelines "are applicable to mission planning and the operation of newly designed spacecraft and orbital stages, and, if possible, to existing ones".[221] They are not legally binding under international law.

At the time of the adoption of the IADC (Inter Agency Space Debris Coordination Committee) Space Debris Mitigation Guidelines, developing countries were considering – exactly like for the climate change issues – that existing debris were not their entire responsibility, and the burden should not be shifted to them as most of the

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[218] Principle II of *Principles Relating to Remote Sensing of the Earth from Outer Space* GA Res 41/65, UNGAOR, 41st Sess, Supp No 53, UN Doc A/RES/41/65 (1986). Online OOSA: <http://www.oosa.unvienna.org/oosa/en/SpaceLaw/gares/html/gares_41_0065.html> (date accessed: March 13, 2013).

[219] Art 11 (d) of the Moon Agreement Supra note 2. An equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon, shall be given special consideration

[220] Inter-Agency Space Debris Coordination Committee mitigation guidelines, A/AC.105/C.1/L.260. Annex. OOSA online: < http://www.oosa.unvienna.org/pdf/limited/c1/AC105_C1_L260E.pdf>, (date accessed: March 27, 2013).

[221] Supra note 220 under Application

debris in space were caused by the space faring nations, basically the United States and USSR.

The principle of equity was raised by several delegations at the UNCOPUOS. Report of countries before the United Nations explicitly refers to the idea of a different responsibility, some delegations supporting the idea that those having caused space debris should bear an increased responsibility.[222] The relevance of the common but differentiated responsibility principle for space debris is supported by authors.[223] Space debris being a global environmental issue, the principle set by the UN FCCC and the Kyoto Protocol could be used. International reports made by scholars support the same idea regarding the relevance of the common but differentiated responsibility principle for space debris. Appendix 2 of the International Interdisciplinary Congress on Space states that the principle is "(..) [E]nabling all States to fulfill their obligations associated with current international efforts in preserving the terrestrial environment, is an important precedent to guide current and future space debris mitigation and remediation efforts."[224]

From all these examples, it appears clearly that the difference of treatment based on countries advanced development is a criterion taken into account in international space law elaboration.

The fundamental principle which will raise most of the difficulties in the new regime to be set up on the resources will be the definition of the responsibilities among

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[222] Peter Stubbe, "Common but Differentiated Responsibilities for Space Debris – New Impetus for a Legal Appraisal of Outer Space Pollution", Report of the European Space Policy Institute ESPI Perspectives No. 31, March 2010. ESPI online: <http://www.espi.or.at/images/stories/dokumente/Perspectives/ESPI_Perspectives_31.pdf> (date accessed March27, 2013). He lists the different meetings where some delegations made statement about this question. UN doc. A/AC.105/911, para. 98. UN doc.A/AC.105/761, para. 135), 2002 (UN doc. A/AC.105/125, para. 125), 2004 (UN doc. A/AC.105/823, para. 103), 2005 (UN doc. A/AC.105/848, para. 99), 2006 (UN doc. A/AC.105/869, para. 109) and 2007 (UN doc. A/AC.105/890, para. 95) and 2009 (UN doc. A/AC.105/933, para. 77) as well as in the reports of the LSC in 2007 (UN doc. A/AC.105/891, para. 27) and 2008 (UN doc. A/AC.105/917, para. 19).

[223] *Supra* note 222. See also M.Y.S. Prasad and Rajeev Lochan, "Common but differentiated responsibility – a principle to maintain space environment with respect to space debris", *Proceedings of the 50th Colloquium on the Law of Outer Space* (Hyderabad, India, IISL/AIAA, 2007) [Prasad and Lochan]

[224] Towards Long-term Sustainability of Space Activities: Overcoming the Challenges of Space Debris. A Report of the International Interdisciplinary Congress on Space Debris, Appendix 2 McGill-Cologne Declaration on Space Debris. 2001, A/AC.105/C.1/2011/CRP.14.

the countries. In this regard, in international law recently, notably on climate change, the implementation of the sharing of responsibility principle generated disagreement among the countries. Despite its inherent implementation difficulties, it is fundamental to keep such approach when elaborating the future regime on space natural resources exploitation, but it will not be sufficient. There will be a need to go beyond. The questions underlying is the equity norms in the governance over the resources. As analyzed below, the deficit of responsibility is the main reason that is generating so much difficulty in the definition of a regime over the resources in an international area.

3. SPACE NATURAL RESOURCES EXPLOITATION REQUIRES – AS FORESEEN IN THE TEXT – A DEDICATED FRAMEWORK

3.1 THE ESTABLISHMENT OF AN INTERNATIONAL REGIME ON SPACE NATURAL RESOURCES WAS PLANNED

Article 11(5) of the Moon Agreement provides: "States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible. This provision shall be implemented in accordance with article 18 of the Agreement." As seen above, the intention underlying this provision was not to prohibit the exploitation of space natural resources since there was no moratorium placed on the resources.

3.1.1 PREREQUISITES: WHAT IS MEANT BY THE WORDS "EXPLORATION", "USE" AND "EXPLOITATION"?

Article 11(5) refers to "exploitation", not to "exploration and use". What is the sense given by the drafters to the word "exploitation" in this provision? In order to answer this question, a close look at the terms: "use", "exploration", "extraction" and "exploitation" as used in both the Outer Space Treaty and the Moon Agreement is necessary in order to identify what is applicable to the present study and what requires further clarification.

3.1.2 LEGAL MEANINGS OF USE

As analysed above, countries adopting the Outer Space Treaty could not foresee what type of space activities the term "use" would cover in the future. At present, the

difficulty is to determine which space activities are included within (or excluded from) the meaning of the term "use" and whether exploitation is included. The definition of the word "use" is broad and the main source of difficulty is that under the existing rules, use of space cannot be in breach of the non-appropriation principle. Thus, "use" is permitted whereas "appropriation" is not; the line between the two is not always easy to draw.

In classic dictionaries, « use » is defined as "take, hold, or deploy (something) as a means of accomplishing or achieving something; employ." [225] The physical properties of outer space have been used to improve the exercise of some activities taking place on Earth. For instance, Peyrefitte[226] considers that "use" covers all space activities having a purpose on Earth, not in space. This includes telecommunication, remote sensing by satellites, satellite broadcasting, and other closely related space applications. According to Peyrefitte, use refers to a practical purpose and does not include purely scientific research purposes. Despite Peyrefitte's views, it can be said that use includes both scientific and commercial Earth-related activities as well as those that are purely conducted in space as long as they do not involve appropriation.

The United Nations French representative Deleau expressed doubts about the scope of the Treaty wondering "what type of activity [the Outer Space Treaty] was to regulate? The text referred to exploration and "use". Did the latter term imply use for exploration purposes, such as the launching of satellites, or did it mean use in the sense of exploitation, which would involve far more complex issues? […] In the case of celestial bodies, it was hard [at the time] to conceive of utilizing the moon, say, for the extraction of minerals."[227] Stephen Gorove has a different approach: the legal meaning of use refers to the enjoyment of property that usually results from the occupancy, employment or exercise of such property.[228] This interpretation seems to be closer to appropriation than to use.

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[225] Oxford Dictionaries < http://oxforddictionaries.com/definition/use?q=use>.
[226] *Peyrefitte*, *Supra* note 8 at 6.
[227] UNCOPUOS, Legal Sub-Committee, Fifth Session, *Summary Record of the 63rd Meeting*, UN Doc A/AC.105/C.2/SR. 63 at 8.
[228] Ernst Fasan, "Celestial Bodies and the Exploitative Use of Outer Space" [1987] XII Ann Air & Sp L 227

For Vasilevskaya,[229] "scientific exploration opens to mankind wide prospects for further practical use of the results of the exploration of outer space and celestial bodies. Without scientific exploration there can be no practical use of natural resources of celestial bodies." During the Moon Agreement negotiation of the Treaty, the US representative to the Committee on the Peaceful Uses of Outer Space Legal Subcommittee, Herbert Reis, stated the following: "we would also want to be careful to ensure that celestial body resources may be used where found for supporting life systems as, for example in uses by astronauts of liquid gases of a particular celestial body."[230]. Commercial exploitation was not foreseen but rather the need to use space natural resources for the practical needs of space missions and nothing more.

According to Cocca, "the right of use is a real one serving oneself of someone else's things independent from the fact of possession or taking from the land what may be necessary for the person who has the use."[231] In Rosenfield's opinion,[232] it is a "general expression of the aspirations of all people that the development and use of outer space should be of universal benefit; in the general advancement of the human race, but without specific obligation on any state exercising its right of use of outer space". There is no limitation upon the use of outer space. On the basis of these opinions, it seems that "use" of space natural resources is allowed as long as the use is limited to the mission itself. In this hypothesis, there is no appropriation.

3.1.3 ARE "EXPLOITATION" AND "EXTRACTION," A "USE"?

According to Peyrefitte, exploit means promote something, get a benefit from it.[233] Outer Space is not considered any more as the place where particular activities take place but as being a resource in and of itself, material or immaterial. In his view, exploitation in the strict sense means to take control of some material elements, for example, to extract Moon minerals. Exploitation of the Moon and celestial bodies will therefore be carried out for purposes of deriving some benefit, either in space or on Earth. Such materials do

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[229] Vasilevskaya, *supra* note 169.
[230] *Ibid* at 230.
[231] *Ibid*.
[232] Stanley B Rosenfield, "'Use' in Economic Development of Outer Space" in *Proceedings of the 24th Colloquium on the Law of Outer Space*, (Herndon, VA: AIAA/IISL, 1981) at 73-79 [Rosenfield, Use in Economic Development of Outer Space].
[233] *Peyrefitte*, *supra* note 8. "(…) exploiter consiste à faire valoir une chose, à en tirer profit».

not exist in the void of outer space. According to Peyrefitte, this is why the Outer Space Treaty does not mention the word "exploitation" but only "exploration and use" whereas "exploitation" appears in the Moon Agreement. In a broader sense, it can be said that, based on the continuous use they make of outer space, some space activities amount to exploitation.

The Outer Space Treaty does not contain specific provisions on space natural resources and their exploitation. At the time of the Treaty drafting, the exploitation of space natural resources was certainly not considered as an issue. Only a few years later, those who drafted the Moon Agreement did recognise the need for such codification during the negotiation of the Moon Agreement. However, authors have expressed divergent views on this specific topic.

Rosenfield[234] stresses the fact that "use" could contain two perspectives: exploitation of natural resources (as envisaged in article 11 of the Moon Agreement) and other uses (as envisaged in article 8 of the Moon Agreement). He argues that it is fair to conclude that the intention of the drafters of the Moon Agreement was to distinguish the two meanings of use. Other authors; e.g.; Hobe[235]; argue that exploitation is included in the freedom of use principle. Hobe's reasoning is based on the fact that General Assembly Resolution 1721(XVI) of 1961 employs the term "use" instead of "exploitation" whereas previous General Assembly Resolutions declaratory of existing principles of space law mentioned "exploration and exploitation." As such, "use" would have to be considered as including "exploitation." Thus, in principle, Hobe considers that the extraction of space natural resources by States for commercial purposes is allowed by article I(2) of the Outer Space Treaty. The Outer Space Treaty applies to non-governmental entities on the basis of article VI and to international organisations under and by virtue of article XIII. As a consequence, Hobe is of the view that States, non-governmental entities and international intergovernmental organisations are allowed to use outer space and celestial bodies

[234] Rosenfield, *supra* note 40, article XI of the Draft Moon Agreement.
[235] Hobe, *supra* note 73.

commercially, including for the extraction of minerals and other resources. Limitations exist, but in the context of other provisions.[236]

It is difficult to agree with Hobe's interpretation for several reasons. "Exploitation" is not included in the Outer Space Treaty. If "exploitation" was included in the scope of the term "use" as argued by Hobe, it would mean that the drafters intended to give it the same meaning. The use of "exploitation" in General Assembly Resolution 1721 was probably intended to mean "utilization" rather than "exploitation" as appears in article 11 of the Moon Agreement.

In any case, it is necessary to extend the analysis in order not to draw premature conclusions on such a delicate issue.

Other authors are of the view that extraction is not included in the freedom of use principle but amounts to exploitation. In the opinion of Kopal,[237] extraction of space natural resources corresponds to exploitation and this is not covered by Outer Space Treaty article I(2). In his view, extraction is not "use", it is exploitation and a new legal instrument is needed. However, extraction that involves the taking of samples for scientific purposes could also be considered as "use". In this case, we are not dealing with exploitation of the resources. When extraction is done, it does not necessary amount to appropriation. A definite answer cannot be provided: extraction of samples for scientific purposes is legitimate as it falls within the scope of the space mission; this is foreseen in the Moon Agreement article 6 on the right to collect and remove samples. Any extraction not intended for the use of the mission is not a "use". The exploitation of resources clearly goes beyond use and is rather close to appropriation.

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[236] *Question of the peaceful use of outer space*, GA Res 1348(XIII), UNGAOR, 13th Sess, Supp No 18 (1958) contains "exploration and exploitation – […] desiring to promote energetically the fullest exploration and exploitation of outer space for the benefit of mankind […]." The same expression appears in *International co-operation in the peaceful uses of outer space*, GA Res 1472(XIV), UNGAOR, 14th Sess, Supp No 16 (1959): "Recognizing the great importance of international cooperation in the exploration and exploitation of outer space for peaceful purposes". Hobe's reasoning is based on the fact that *GA Res 1721(XVI)*, *supra* note 181 mentions the fact that "Outer space and celestial bodies are free for exploration and use by all States" and for this author, "use" would have to be considered as including "exploitation".

[237] Kopal, *supra* note 105.

We can conclude that, except in the case of scientific sample extraction for a specific scientific mission, the extraction of space natural resources is not included in the freedom of use principle.

3.1.4 MOON AGREEMENT PROVISION IN 1979

Article 11(7) of the Moon Agreement provides that the main purposes of the new regime to govern the exploitation of space natural resources shall include: (a) The orderly and safe development of the natural resources of the Moon; (b) The rational management of those resources; (c) The expansion of opportunities in the use of those resources; (d) An equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon, shall be given special consideration.

This provision is an interesting indication of what was foreseen in the 1970's. The first three provisions do not raise significant concerns and are acceptable even today. The issue of equitable sharing was, however, a difficult one.[238] Developing countries are not defined in this paragraph, neither are the direct or indirect contributions of countries. Kopal considers that the fourth provision was the result of a compromise between countries and that the intention was not to create a legally binding rule. It is difficult to find a justification to depart from those elements that seem totally reasonable. One solution proposed by Galloway is that sharing would be in accordance with the degree of a State Party's contribution to a project.[239]

Article 11(5) of the Moon Agreement mandated the establishment of an international regime but did not require or provide for the establishment of an institutional mechanism to implement the resultant regime.[240] This starkly contrasts with the regime that was developed to govern the exploitation of the resources of the deep seabed under the UNCLOS. The Moon Agreement's silence about the institutional framework for the

[238] See *supra* under III.
[239] *Galloway Report*, *supra* note 18.
[240] Rosenfield, *supra* note 40, article XI of the Draft Moon Agreement, at 210.

implementation of the envisaged regime is, however, not fatal and it can be addressed during the development of the regime.[241]

Finally, article 11(8) of the Moon Agreement states that "all the activities with respect to the natural resources of the Moon shall be carried out in a manner compatible with the purposes specified in paragraph 7 of this article and the provisions of article 6, paragraph 2, of this Agreement." This means that as long as the international regime has not been put into place, the provisions relating to the right to remove and collect samples remain applicable and there is no moratorium on the exploitation of resources.

The Moon Agreement is a compromise.[242] The Common Heritage of Mankind is related to the Moon and its natural resources. States Parties have made a commitment for the future to establish an international regime on the exploitation of the space natural resources as such exploitation is to become feasible. An obvious conclusion is that use of space natural resources is permitted as long as there is no appropriation. It is a global provision applicable to outer space activities including those involving the extraction of space natural resources. The fact that there is no detailed definition in the Outer Space Treaty is not unusual. "Use" goes beyond the scope of scientific exploration purposes but is not the same as "appropriation." Depending on the nature of each space activity, it is possible to classify it as a "use" (considered legitimate) or "appropriation" (which is prohibited by the Outer Space Treaty). "Exploitation" means regular extraction and refinement of natural resources for commercial purposes.[243] It is not the extraction of resources for research and scientific investigation. "Exploitation" goes beyond "use" and requires dedicated provisions.

V. CONCLUSION

To conclude, the Moon Agreement has been discussed at two levels: the first considered the Agreement from a global perspective in order to determine its legal value since it has not been widely ratified by states. The second reviewed some of its provisions.

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[241] See *infra* Chapter V.
[242] For a discussion of the context surrounding the adoption of the Moon Agreement, see Galloway Article, *supra* note 25. See also Kopal, *supra* note 105.
[243] Jakhu, *supra* note 43.

From a global perspective, the Moon Agreement has entered into force on the basis of its article 19 and it is therefore fully applicable and binding on the States Parties that have ratified it. However, opponents of the Moon Agreement have used the low level of ratification as a basis for arguing that the Agreement has no legal value. Despite article 18 on the need to review the agreement 10 years after its entry into force, nothing has happened. Although there are not many ratifications, we cannot ignore the fact that a consensus was reached on the text at the conclusion of the negotiations. The Agreement has not been ratified by the key space-faring nations, so the debate about its legal value is fully understandable from a political perspective. However, the debate is of no consequence from a purely legal perspective. It is not possible to state that the provisions of the Moon Agreement are declaratory of customary law rules; the lack of activities on the Moon does not provide the consistent state practice needed to reach such conclusion at this time. We can consider that the good faith principle applies on the basis of the Vienna Convention on the Law of Treaties, but this will not be sufficient. As a consequence, the status of the Treaty and its implementation require clarification to put an end to the controversies and define a clear regime that would be applicable to exploitation of the resources of the Moon and other celestial bodies.

We have seen that there are significant provisions in the Outer Space Treaty that are applicable to the Moon. In addition, there are several key mechanisms that have been elaborated upon in the Moon Agreement and which continue to be very relevant today. Art 11(3), which prohibits the acquisition of property rights on the Moon, is among the particular provisions of the Moon Agreement that give the treaty added value. This provision should help to reject the claims to property rights that have surfaced in recent years, in particular, since the difference in language between the two agreements has been used to support those claims. The Common Heritage of Mankind principle has also been the source of concern. This principle is, however, limited to the Moon Agreement and will not be implemented until it becomes possible to exploit space natural resources. Recent developments in international law, using the common but differentiated responsibility, could help to ensure the allocation of rights to the developed, but also developing countries, when the regime on the resources exploitation will be elaborated.

With respect to the resources, it appears from the negotiating history of the Moon Agreement that no moratorium over resources exploitation was agreed upon. There was an important gap in time between the formulation of space law and the potential to see the exploitation of resources. Moreover, the legal value of the "understandings" remains unclear. Developing countries supported the idea of a moratorium, but the negotiating history shows that the proposals were not accepted. Article 11 of the Moon Agreement states that Parties "undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible." The time has come to move to the next step and to define the regime as the exploitation of space natural resources is about to become feasible and space entrepreneurs are interested by this new activity.

As a consequence, if the Moon Agreement is not ratified or adhered to, the Outer Space Treaty will continue to apply. Without additional key provisions, there is a risk exploitation of space natural resources will take place before a dedicated regime on the resources is established. Despite the lack of ratification of the Moon Agreement, the international community cannot ignore the fact that the Agreement plans for the elaboration of such a regime and the Outer Space Treaty alone is not sufficient to cover all the issues related to such activities. This will lead to an issue of international behaviour of a State in the front of this international community. Based on this assessment, the second Part of the study will examine ways to consolidate the existing mechanisms in order to define a realistic applicable regime for the resources.

INTRODUCTION TO PART II

PART II – THE SEARCH FOR A LEGAL FRAMEWORK TO GOVERN THE EXPLOITATION OF SPACE NATURAL RESOURCES – A "STEP BY STEP APPROACH"

As demonstrated in Part I of this dissertation, the exploitation of space natural resources will become a prominent feature of space exploration programs in the not too distant future. Part I emphasized the political dimension of the subject thereby demonstrating the necessity to establish an appropriate legal regime to govern such exploitation. The analysis of the current legal framework showed that, although there is already in existence a solid legal framework governing the conduct of outer space activities, the existing regime does not provide a sufficient basis for regulating the exploitation of space natural resources. As mentioned in article 11(5) of the 1979 Moon Agreement, an international regime needs to be established.[1]

The next step in the search for an appropriate legal framework for space natural resources is to analyse and draw analogies from a few existing regulatory models. In an effort to identify what would be the most appropriate regime for space natural resources, this dissertation investigates the development and elaboration of international law in general and space law as *lex specialis*. Based on comparative analyses of the legal regimes governing the exploitation of natural resources in other international areas, namely Antarctica and the Sea, an effort is made to determine the approaches that succeeded and those that failed, and where appropriate, to identify principles that could be transposed to govern the exploitation of the natural resources of outer space.

Part II of this dissertation proposes suitable solutions in two steps. The first step (Chapter IV titled "the framework and the political dimension") defines the type of legal framework that would best suit the exploitation of space natural resources. Based on analogies drawn from the Law of the Sea and the Antarctica Treaty, the second step (Chapter V titled "the sea and Antarctic models: a comparative approach") identifies the specific legal content of the framework considered appropriate to govern the exploitation of space natural resources. A concluding chapter (Chapter VI titled: "Findings, conclusions and a proposal") presents a proposal for the establishment of such a regime.

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[1] *Agreement Governing the Activities of states on the Moon and other Celestial Bodies*, 18 December 1979 1363 UNTS 3, 18 ILM 1434 [*Moon Agreement*].

CHAPTER IV – THE FRAMEWORK AND THE POLITICAL DIMENSION

I. INTRODUCTION

International space law is part of general international law. This implies that the latter is also applicable to outer space activities, including those that relate to space natural resources. In order to propose elements regarding the definition of international law dedicated to space natural resources, there is the need to start from the underlying theory and the constant expansion of international law. In this chapter, a synthetic review of the different theories of international law, together with the sources and scope of the law, is undertaken in order to gain an understanding of the dynamics currently driving or influencing the formation of international law.

The present chapter is divided into two sections: The first section deals with the legal theories and sources of international law including space law as a body of *lex specialis* within general international law. Considering the adaptations which occurred in these two domains, mainly after the Second World War, the second section of this chapter focuses on contemporary legal systems and their impact on international law. Based on experiences derived from the creation of international space law and today's space law-making mechanisms, a proposal will be made on the type of instrument that will be most suited to the governance of space natural resources exploitation.

II. THE FORMATION OF INTERNATIONAL LAW: LEGAL THEORIES AND SOURCES

Traditionally, the formation of international law has been analysed on the basis of the theory of sources of international law. A distinction is traditionally made between conventional norms (treaty provisions) and non-conventional norms (customary law). However, there is also a need to take into account social and political factors and their evolution since the middle of the 20th Century. In this regard, Pierre-Marie Dupuy mentions notably the creation of the United Nations Organisation as well as numerous organisations with universal goals, and the multiplication of new States on the international scene.[1] While the reasons may slightly differ, the space law-making process has also evolved since the elaboration of conventional norms came to a halt in 1979 following the adoption of the Moon Agreement. Before addressing the sources of

[1] Pierre-Marie Dupuy, *Droit International Public*, 9th ed (Paris: Dalloz, 2008) at 277-278 [*Dupuy*].

international law, the next section briefly outlines fundamental legal theories relevant to the development of international law and space law.

1. THE LEGAL THEORIES

Between, the 16th and the 18th Centuries, the pioneers of international law established the grounds for the formation of international law. The first school of thought that emerged in this era was the natural law theory. Subsequently, beginning from the mid-18th century, the positivist theory influenced the development of international law, with Vattel being considered as the precursor of this new approach.[2]

The theory of natural law[3] originally emanated from Aristotle and the stoic school. For supporters, such as Dominican de Vitoria, there is a natural law which is above the law of the State. Like man, States need to live in a community. This is why States need an international society and international law is made to govern this specific society. Natural law is of universal application and forbids appropriation of the High Seas according to this reasoning.[4] Vitoria names international law as *jus inter gentes* or law between peoples. For the Spanish theologian Suarez, natural law is immutable while *jus gentium* is subject to evolution, like the positive law. Suarez stresses that the two are closely linked: positive law needs to be consistent with natural law, a means to keep natural law above State law. Based on this theory, "the Law of Nature was hierarchically superior to the voluntary law."[5] His theory was largely inspired by Christianity.[6]

Grotius is considered to be the father of international law. As a Dutch humanist and Universalist, Grotius conceived the law as extending beyond borders and religions. He made a distinction between what is human and what is divine. He considered that

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[2] Patrick Daillier et al, *Droit international public*, 8th ed (Paris: Libr. générale de droit et de jurisprudence, 2009) at 64 *et seq* [*Daillier et al*].
[3] For more information about Grotius and the natural law theory, see Oregon State University website, online: <http://oregonstate.edu/instruct/phl302/philosophers/grotius.html> (date accessed: March 13, 2012)
[4] Verlinden Charles. Weckmann (Luis). *Las Bulas Alejandrinas de 1493 y la teoria politica del Papado medieval. Estudio de la supremacia papal sobre islas, 1091-1493* ; Introduction de E. H. Kantorowicz ; un vol. in-8° de 311 pp, *Revue belge de philologie et d'histoire*, 1951, vol. 29, n° 2, pp. 588-596. Online : <http://www.persee.fr/web/revues/home/prescript/article/rbph_0035-0818_1951_num_29_2_2103_t1_0588_0000_3>.
[5] Sir Ian Sinclair, *The Vienna Convention on the Law of Treaties*, 2d ed (Manchester: Manchester University Press, 1984) at 204 [*Sinclair*].
[6] Christian Tomuschat, "Obligations arising for States without or against their will" (1993) IV:241 Rec des Cours 233.

nature (and not religion) determines what is good or bad. Grotius was in opposition with the Calvinist approach. Natural law theory is close to a rationalist theory. His theory on the natural law in *De Jure Praedae* ("*On the Law of Prize and Booty*"), written in the 17th Century, was discovered in the 19th Century.[7] His most famous work was *De jure belli ac Pacis* ("*On the Law of War and Peace*")[8] where he first defined his views on international relations between States. According to Grotius, the State is sovereign and therefore undertakes acts independent of any superior authority; the force of the law being the only acceptable limitation. Grotius also highlighted the distinction between natural law (natural law of nations, *jus naturae*) and voluntary law (customary law of nations, *jus gentium*) which includes all the rules applicable to international law. In his view, this voluntary law needs to be consistent with natural law.

Emmerich de Vattel is at the origin of the theory legal positivism. His most famous book is titled "the Law of Nations or Principles of the Law of Nature."[9] In his approach, international society is the society of nations. Vattel's theory adds an element to the recognition of the existence of natural law; the State is considered as the sovereign interpreter of this law. "Every nation that governs itself, under what form so ever, without dependence of any foreign power, is a *Sovereign State.*"[10] However, Vattel believes that it behoves upon each sovereign State to evaluate what it shall do in the frame of its international obligations. Contrary to the views expressed by Grotius, Vattel grants an important role to the monarchy. Vattel believes that natural law is necessary but differs from Grotius in his belief that sovereign States can modify or interpret natural law. Vattel's views are considered as the founding basis of positivism since he gives preference to the law defined by the will of a State: *jus positum*.[11]

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[7] Hugo Grotius, *De Jure Praedae Commentarius. Commentary on the Law of Prize and Booty. A translation of the original manuscript of 1604*, translated by G. L. Williams and W. H. Zeydel (Oxford: Clarendon Press, 1950).
[8] Hugo Grotius, *De Jure Belli ac Pacis (On the Law of War and Peace)*, translated by John W. Parker (Cambridge: Cambridge University Press, 1853).
[9] Emerich de Vattel, *The Law of Nations, or, principles of the law of nature, applied to the conduct and affairs of nations and sovereigns*, translated by Joseph Chitty (Philadelphia: T & JW Johnson, 1853)
[10] *Ibid*.
[11] *Daillier et al*, *supra* note 2 at 66-67.

The theory of legal positivism does not reject natural law but rather stresses the importance of constituting elements of international law, with a focus on State practice.[12] Some authors are considered as "pre-positivists" (Moser, de Martens) as they keep the link with natural law while 20th Century theorists do not.[13] The positivist theory developed progressively during the 18th Century and could be defined by the study of formal sources. Legal positivism excludes any ethical, social or political reasons in relation to legal norms.[14] Legal positivism became a major theory in the second half of the 18th Century. Its strongest supporters held the view that States should be the sole source of international law.[15] Today's positive law is based on this theory and has not changed; it is based on voluntary international relations between States.[16] Tomuschat defends the idea that natural law was justified at a time when governments were strongly guided by religious beliefs. "In the world of today, critical rationalism has swept away such naive trust in a harmonious balance that exists independently of any human effort... Good government among humans can only be the work of humans. Mankind can neither rely on God nor on nature."[17]

Both natural law and positivism are needed in the elaboration of international law in order to take into account international society[18] and the States as sources. Depending on the topic to be covered, the right balance needs to be established. Natural law theory remains important although religious considerations are no longer a reason or a driving force underlying the development of legal norms.

There is no legal theory related to outer space law considering its contemporary developments. By their very nature, space activities transcend national boundaries and

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[12] *Ibid* at 205.
[13] *Ibid* at 68.
[14] *Dupuy*, *supra* note 1 at 279 paragraph 230.
[15] *Daillier et al*, *supra* note 2 at 205.
[16] *Ibid* at 68-69. See in particular his summary of constitutive elements of positivism: "1° Les Etats sont souverains et égaux entre eux ; 2° La société internationale est une société interétatique : au point de vue de sa structure, elle apparaît comme une juxtaposition d'entités souveraines et égales entre elles, excluant tout pouvoir politique organisé et superposé à ses composantes ; 3° Le droit international est exclusivement interétatique et ne s'applique pas aux individus ; 4° En ce qui concerne ses sources, le droit international est issu de la volonté et du consentement des Etats souverains ; les traités proviennent d'un consentement exprès et les coutumes d'un consentement tacite ; 5° Les Etats souverains apprécient seuls ce qu'ils doivent faire ou ne pas faire dans les relations internationales ; 6° Dans les rapports entre Etats souverains, la guerre est permise."
[17] *Sinclair*, *supra* note 5 at 234.
[18] In this regard, see discussion below about the notion of international community.

consequently, are of interest to the entire international community of nations.[19] International space law therefore inherently forms part of the law of nations. International space law is not a distinct source of international law;[20] it is based on international relations. Marcoff stresses that the norms of international space law that govern outer space exploration and use are created by the social interaction of States within the international community.[21] Other branches of international law have also inspired the formation of space law, and historically we can refer to the legal theory of *Mare Liberum (The Freedom of the Seas)* which dealt with the rights of Spain, Portugal and England over the seas and the impact it had on the freedom of the Dutch to sail on those seas. As a Dutch citizen, Grotius naturally favoured the concept of liberty of the sea and the proposition that the sea cannot be appropriated by any one nation.[22]

What link can be made between the formation of international law theory and the conduct of space activities? To date, the conduct of space activities has been dominated by governmental entities and, in the future, most of the developments will still be carried out by governments while the emergence of new actors in space will increase. In this regard, the theory of positivism seems more appropriate in the view of the fact that any potential private activity in space must be performed under the authorization and continued supervision of States. In this regard, the ultimate responsibility to regulate the conduct of space activities falls upon States and their governments.[23]

In order to fully apprehend the definition of a new regime on space natural resources exploitation, it is necessary to look at contemporary critical movements that have emerged in the field of international law. In fact, the question of natural resources management in an international area has generated debate among scholars, notably a large theoretical debate between developed and developing countries.

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[19] Marco G Marcoff, *Traité de Droit international public de l'espace*, (Fribourg: Editions Universitaires Fribourg Suisse, 1973) at 5 [*Marcoff*].
[20] For the historical context, see L Peyrefitte, *droit de l'espace*, (Paris: Précis Dalloz, 1993) at 18, paras 47-48 [*Peyrefitte*].
[21] *Marcoff*, *supra* note 19 at 7.
[22] See Oregon State University website, *supra* note 3.
[23] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, 610 UNTS 205, 18 UST 2410, TIAS No. 6347, art VI [*Outer Space Treaty*].

Behind the legal issues around the sharing of the resources in international law, the broader question to be addressed is which vision of international law for the future should be adopted. In this regard, since space law was elaborated from the 60's until the 80's, international law theories have evolved in the last decades.

The "New Approaches to International Law" (NAIL) began as an academic movement in the US, at Harvard University in the 1980's.[24] Among the most famous scholars, David Kennedy and Martti Koskenniemi were supporting an entirely new approach of international law. David Kennedy supported the idea of "social theorists to deconstruct conventional ideas about politics, law, and the State".[25] Martti Koskenniemi supports the idea that international law needs to address "more concrete forms of political commitment", requiring a more participative than theoretical approach from the lawyers.[26] He concludes that "a demonstration that 'it all depends on politics' does not move one inch towards a better politics."[27] He notably strongly criticizes "managerialism" "that suggests that international problems – problems of 'globalization' – should be resolved by developing increasingly complicated technical vocabularies for institutional policy –making".[28] He privileges an alternative approach[29]. In this regard, one can tell he was fully right when addressing the difficulties for setting appropriate

[24] Andrew F. Sunter, "TWAIL as Naturalized Epistemological Inquiry", Canadian Journal of Law and Jurisprudence, Vol. 20, No. 2, 2007, online: <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=995532> (date accessed: March 13, 2013). [*Sunter*]

[25] *Sunter, supra* note 24 and David Kennedy, "A New Stream of International Law Scholarship" (1988-1989) 7 Wiscontin International Law Journal. He stated that NAIL was "a specific effort of a group of legal academics in particular institutions to encourage one another's work, hold conferences, write more and differently, get to know people they would not otherwise have met, experiment with new methods and ideas.

[26] Martti Koskenniemi "'Intolerant Democracies': A Reaction" 37 Harvard International Law Journal (1996) 234 -5. *From Apology to Utopia; The Structure of International Legal Argument* (Cambridge: Cambridge University Press, 2005) (originally published in 1989). Extrait du livre "La politique du droit international". In a conference in Paris I University in February 2004 he stated the following which summarizes this character : « I think international law has a wonderful political and intellectual potential (this is why I am interested in its history) but that it has in the 20th century become – malgré soi – a small bureaucratic discipline at law schools. My project is to try to revive a sense of its original mission, its importance. I suspect I am creating a myth (for it probably never was much better) – but myth-creation is an important aspect of political activity and activism. » (M. Koskenniemi, Conférence à Paris I, février 2004) .

[27] Martii Koskenniemi, "The Politics of International Law – 20 years later", The European Journal of International Law, 2009, Vol. 20 n°1, 7-19.

[28] *Ibid*, p 15.

[29] Rebecca LaForgia, "The Politics of International Law – 20 years later: A reply to Martii Koskenniemi", The European Journal of International Law, 2009, Vol. 20 n°4. 979-984.

regime on natural resources management, despite all the efforts made in the different areas, notably the sea and Antarctica.

The NAIL movement preceded another approach, the Third World Approach to International Law (TWAIL). A Southern perspective of international law is at the origin of the TWAIL movement. The TWAIL emerged in the mid 1990's from the NAIL movement to address Third World issues. Despite the end of the colonization, globalization and all the international mechanisms with it have an important impact on the developing countries.[30] Several authors were at the origin of this new movement[31]. Among them, B.S. Chimni regrets that TWAIL was not able to develop an alternative vision to international law. He promotes the need for third world people to address their ethical concerns.[32] The role of the dominant State in the era of globalization is underlined by several authors.[33] The South is often considered as not being able to govern itself.[34] Among the topics that "deserve the attention of the third world scholars"[35] Chimni cites the need to ensure sustainable development with equity. His concern is that the responsibility to reach the objective shall not be transferred to third world countries. Recent scholars' intention was to take some distance from the post colonialist movement which would be at the same time a reform and resistance from international law, offering to move from the TWAIL approach in the direction of a new universality.[36] Beyond the post colonialist related questions, Professor Okafor underlines the need to take into account "third-world people (especially their broadly shared histories, experiences, situations, and yearnings) much more seriously than has hitherto been the case,

[30] B. Jones, "The World Upside Down? Globalisation and the Future of State 4 (2000). [*Jones*]
[31] Prof. R. P. Anand, Prof. B. S. Chimni, Anthony Anghie, Karen Mickelson, Prof. J. T. Gathii and Prof O. Okafor are cited by Mr V. D. Shetty in "Why TWAIL must not fail: origins and applications of Third World Approaches to International Law, online <http://www.profrpanand.info/node/32> (date accessed: March 30, 2013).
[32] B. S. Chimni, "Third World to International law : A Manifesto", International Community Law Review, Vol 8, pp 3-27, 2006. [*Chimni*].
[33] *Jones, supra* note 30 and *Chimni, supra* note 32 .
[34] *Chimni, supra* 32 and F. Furedi, "The Moral Condemnation of the South", in C. Thomas and P. Wilkins (Eds.), Globalization and the South 76-89, at 79 (1997).
[35] *Chimni, supra note 32*.
[36] Luis Eslava and Sundhya Pahuja, "Between resistance and Reform: TWAIL and the Universality of International Law", Trade, Law and Development, Vol III, Issue 1 (2011).

international lawyers are not likely to succeed in imaging – and what is more necessary, in helping to create – a much more equal, fair, and just world."[37]

These approaches are linked to the whole issue of the sharing of the resources in an international area. As analyzed in this study, and reinforced by authors, international space law or the law of the Sea have been built in the interest of developed countries, not fully addressing the question of equity in the regime over the natural resources, and the trend is not going in the third world direction. Developments in international law show that liberalism doctrine still prevails; it grants rights to the countries having the technology. As a consequence, those not yet having such capacities are prevented from benefiting from the new law. For example, with the adoption of the 1994 Protocol, this is a clear trend in the law of the Sea.[38]

"The ruling elite of the third world has been unable and/or unwilling to devise, deploy, and sustain effective political and legal strategies to protect the interests of the third world people"[39]. Environmental issues, including the management of the resources and the common heritage of mankind were at the center of the Third World reform movements.[40] The focus was on natural resources, sovereignty and fair sharing of resources from common areas such as the deep sea bed[41]. Despite less engagement in those topics in the 1990's, it appears that TWAIL is engaged again in these matters.[42] Usha Natarajan underlines the increasing interest for climate change and biodiversity topics.

This trend has not reached to a point that space law topics are part of the engagement in an international forum. However, one shall not neglect the role of regions in the negotiation of space law. The trend was not new when a group of countries prepared the Bogota Declaration[43], equatorial countries in 1976 claiming rights over the

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[37] Prof. O. C. Okafor, "Newness, imperialism, and international legal reform in our time: a TWAIL perspective", Osgoode Hall Law journal, Vol. 43 n°1 & 2, pp 171-191 (2005).
[38] See *Infra* Chapter V.
[39] *Chimni, supra* note 32.
[40] Usha Natarajan, "A TWAIL reading of the Arab Spring : Reflections on Sovereignty over Natural Resources", Anand Virtual Centre of International Law, 2011, online : <http://www.profrpanand.info/node/31> (date accessed: March 12, 2013). [U*sha Natarajan*]
[41] R. P. Anand, The Legal Regime of the Sea Bed and the Developing Countries (1975).
[42] U*sha Natarajan , supra* note 40.
[43] Declaration of the First Meeting of Equatorial Countries ("Bogota Declaration") of December 3, 1976 See: ITU Doc. WARC-BS (1977) 81-E, January 17, 1977.

geostationary orbit. Today, the Group of Latin American and Caribbean Countries (GRULAC) is a group of countries at the UN which have joined efforts to try to get more equity in the elaboration of international space law. Since the 60's, the group of countries that represent the majority at the United Nations, has worked to see the establishment of a new order.[44] It could well be that some countries – not those leading space activities today – could engage in the defense of sustainable development and impact at some point the field of international space law and space natural resources exploitation.

2. THE LEGAL SOURCES

The success of any legal regime on the exploitation of space natural resources will depend not only upon the content thereof but also on the framework that supports the content. A review of the traditional sources of law is thus indispensable for the present study. The sources of general international law and of space law are examined in order to propose an appropriate legal regime to govern the potential exploitation of space natural resources. The following statement from Georges Scelle metaphorically illustrates the meaning of the source of law: the source is not the origin of the water. The source means there is an underground tablecloth without which it would not exist. It is the same for the sources of law. Sources of law are not at the origin of the law, but its human expression.[45]

The formation of international law has evolved immensely since the 1960's. A few years after the commencement of space activities, the five existing space law treaties were elaborated under the auspices of the United Nations. Similar codification work was carried out by the United Nations in other emerging areas of international law such as human rights and humanitarian law, law of the sea and international economic law.[46] Since that time, new trends have been observed in the elaboration of space law, notably

[44] Ram Jakhu, «Developing Countries and the Fundamental Principles of International Space Law » in New Directions in International Law: Essays in Honour of Wolfgang Abendroth – Festschrift zu einem 75. Geburstag, Campus Verlag, Frankfurt/New York, p 351-373.
[45] Georges Scelle, *Essai sur les sources formelles du droit international*, t 3, (Paris: Mélanges Gény, 1934) at 400 [*Scelle*]. «La source n'est pas l'origine de l'eau; elle est sa manifestation extérieure, le fait perçu et probant, l'élément captable et utilisable. Mais la source suppose une nappe souterraine, parfois inconnue ou mal connue, dont l'existence n'est pourtant indiscutable, puisque les sources sans elle n'existeraient pas. Il en est de même des sources du droit. Elles ne constituent pas la totalité du fait juridique; elles ne sont pas l'origine du droit, elles en sont la preuve décélatrice, l'expression humaine».
[46] Marco G Marcoff, "Sources du droit international de l'espace" (1980) 168: III Rec des cours 35 [Marcoff, Sources].

the increasing role of international organisations and novel mechanisms for maintaining and conducting international relations.[47] The formation of international space law was closely linked to the fundamental structure of international society. Customary and conventional norms were the sole sources from which general international law and space law developed.[48] In view of the foregoing, the question today is whether the future regime to govern the exploitation of space natural resources requires a fundamental change in the manner in which space law has traditionally developed.

Article 38 of the Statute of the International Court of Justice[49] deals with the "Competence of the Court": 1. The Court, whose function is to decide in accordance with international law such disputes as are submitted to it, shall apply: a. international conventions, whether general or particular, establishing rules expressly recognized by the contesting states; b. international custom, as evidence of a general practice accepted as law; c. the general principles of law recognized by civilized nations; d. subject to the provisions of Article 59, judicial decisions and the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law. 2. This provision shall not prejudice the power of the Court to decide a case *ex aequo et bono*, if the parties agree thereto.

Given its status as an Annex to the Charter of the United Nations, however, the Statute of the International Court of Justice has a contractual dimension to it that makes it very different from any other international constitutional provision. As stressed by Dupuy, the Statute is now more than 50 years old and the international society has changed.[50]

The traditional distinction between the formation of conventional and non-conventional norms of international law is examined below as a precursor to the analysis presented in this section. In order to choose the elements of an appropriate regime to

[47] *Ibid* at 17 and 21.
[48] *Ibid* at 26. "Seuls des changements profonds au niveau de l'organisation socio-politique de la communauté internationale seraient à même de provoquer des modifications structurelles dans l'ordre juridique international, en y introduisant des formes plus évoluées d'élaboration normative."
[49] See article 38 of the *Statute of the International Court of Justice*, annexed to the *Charter of the United Nations*, 26 June 1945, Can TS 1945 No. 7.
[50] *Dupuy*, *supra* note 1 at 281 paragraphe 231. "Cette disposition ne mérite ni l'excès d'honneur ni, plus rarement, l'indignité que lui réservent trop de commentateurs. Elle offre tout au plus un guide utile et une typologie opératoire."

govern the exploitation of space natural resources, it is necessary to pay particular attention to the following factors: the regime will govern the exploitation of resources by both current and future generations, very likely for scientific and commercial purposes, in an international area where human access is presently difficult and any type of control is also physically impossible. In view of the foregoing, the question then becomes: what framework would be most suitable for the governance of such activities in order to ensure that the exploitation of space natural resources is carried out in an equitable and orderly fashion by all the actors involved?

2.1 CONVENTIONAL FORMATION OF INTERNATIONAL LAW: INTERNATIONAL CONVENTIONS

An analysis is required to propose the source(s) of law that would be most appropriate for the proper governance of the exploitation of space natural resources. Beyond the traditional sources of law, is there another approach of interest for the exploitation of space natural resources?

2.1.1 GENERAL INTERNATIONAL LAW AND INTERNATIONAL CONVENTIONS:

One major source of international law relates to general or particular international treaties executed between States and establishing rules expressly recognized by those States as Contracting Parties thereof. [51]

In order to illustrate how ancient state relations dealt with treaties, an example will be given; Tell-Mardikh (Ebla) is the best source to learn about ancient North Syrian civilisation.[52] Between 1964 and 1975, archaeological excavations were made at Ebla and thousands of cuneiform tablets dated around 2500 BC were discovered.[53] Exchanges revealed by the tablets demonstrate the strong and complex relations between Ebla and its neighbouring States (Egypt, Anatolia, Mesopotamia, Afghanistan), highlighting advanced knowledge in this area of the world during those ancient times. The tablets also revealed the conclusion of treaties between Ebla and other cities. For instance, Ebla's eminent king Ibrium concluded a treaty relationship with the city of Ashur under which Assyrian king

[51] See article 38.1 of the *Statute of the International Court of Justice,* supra note 49.
[52] For more information about the Ebla excavations, see Myths and Religions website, online: <http://www.mythes-religions.com/tag/ebla/> (date accessed: March 13, 2012).
[53] *Dupuy*, *supra* note 1 at 281 paragraph 232.

Tudia was granted the use of trading posts officially controlled by Ebla.[54] Thus, historically, treaties were used as an important and appropriate means of achieving international cooperation between States. Today, treaties are of specific interest to newly created States as their adhesion to a convention places them at the same level as any other existing State party thereto.[55] While the context is different in space as there are no neighbouring States, by transposing this example into the future, we could imagine States needing to develop a regime to govern resources exploitation.

After the Second World War, a tremendous amount of work was done on international public law. The International Law Commission (ILC) was created in November 1947 by the United Nations General Assembly.[56] Article 1.1 of the Statute of the Commission states that: "the International Law Commission shall have for its object the promotion of the progressive development of international law and its codification."[57] The Commission can also cooperate with other bodies.[58] The International Law Commission has significantly contributed to the development of international law, notably with the 1969 Vienna Convention on the Law of Treaties[59] and the 1986 Vienna Convention on the Law of Treaties between States and International Organizations or between International Organizations.[60] The 1986 Convention complements the earlier treaty as it addresses conventions concluded between states and international organisations and among international organisations.

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[54] For explanations about the Ebla excavations, see Homs online website, online: <http://www.homsonline.com/EN/Citeis/Ebla.htm> (date accessed: March 13, 2012)
[55] *Dupuy*, *supra* note 1 at 281 paragraph 232.
[56] Establishment of an International Law Commission, UN GA Resolution A/RES/174(II). 118 Plenary Meeting, 17 November 1947. UN online: <http://www.un.org/french/documents/view_doc.asp?symbol=A/RES/174%28II%29&TYPE=&referer=http://www.un.org/fr/aboutun/structure/ilc.shtml&Lang=E> (date accessed: June 25, 2012).
[57] *Ibid* art 1.1 of the Statute of the International Law Commission. Art 15 provide further details: the expression "progressive development of international law" is used for convenience as meaning the preparation of draft conventions on subjects which have not yet been regulated by international law or in regard to which the law has not yet been sufficiently developed in the practice of States. Similarly, the expression "codification of international law" is used for convenience as meaning the more precise formulation and systematization of rules of international law in fields where there already has been extensive state practice, precedent and doctrine.
[58] *Statute of the International Court of Justice*, *supra* note 49 art 25. The Commission may consult, if it considers necessary, with any of the organs of the United Nations on any subject which is within the competence of that organ.
[59] *Vienna Convention on the Law of Treaties* 23 May 1969, 1155 UNTS 331 [*VCLT*].
[60] *Vienna Convention on the Law of Treaties between States and International Organizations* 1986

The 1969 Vienna Convention on the Law of Treaties opened for signature on 23 May 1969 and entered into force on 27 January 1980. At the beginning of the negotiations leading to its adoption, the idea of a convention was not entirely endorsed as lawyers were privileging the idea of an expository code. The decision to prepare a convention was based on the fact that it was (and continues to be) a more effective means of consolidating the law and would thus help new States to participate in the creation of new law. This view was initially proffered by Professor Ago, a member of the Commission.[61] What follows is an attempt to discuss the key features of the 1969 Vienna Convention in an effort to analyse its impact on the formation of international law and international space law in contemporary times.

The preamble to the 1969 Vienna Convention recognizes the existence of fundamental principles of international law: "the principles of free consent and of good faith and the *pacta sunt servanda* rule are universally recognized."[62] A treaty is defined in article 2 as "an international agreement concluded between States in written form and governed by international law, whether embodied in a single instrument or in two or more related instruments and whatever its particular designation."[63] As noted above, the 1969 Vienna Convention codifies the rules governing treaties executed between States and not treaties entered into between international organisations or between such organisations and States. The latter category of treaties is governed by the 1986 Vienna Convention which has not yet entered into force. Today, the Vienna Convention is considered as a codification of the basic rules of law applicable to international treaties. This status derives from the fact that it was built on pre-existing customary law that was applicable to all States irrespective of whether they are States Parties to the convention or not.[64]

As far as space activities are concerned, some provisions of the Vienna Convention are of particular importance. Provision is made for the settlement of disputes

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[61] *Sinclair*, *supra* note 5 at 4. Professor Ago said:
"Ce qui s'impose dans la société internationale d'aujourd'hui c'est un réexamen approfondi des branches fondamentales du système juridique de cette société, c'est une nouvelle définition des principes faite avec la participation directe et active de tous les membres actuels de ladite société, de manière à parvenir à la formulation de règles qui représentent un juste équilibre entre les différentes conceptions et tendances, et qui répondent aux besoins d'une communauté internationale devenue réellement universelle."
[62] *VCLT*, *supra* note 59 preamble para 2.
[63] *Ibid* art 2.
[64] *Dupuy, supra* note 1.

in the Annex to the 1969 Vienna convention where stated provisions on conciliation measures are related to the application or interpretation of any of the other articles of Part V of the convention. Article 3 of the Charter of the United Nations provides that all Members of the United Nations shall settle their international disputes by peaceful means in such a manner that international peace and security and justice are not endangered.[65] Article 33 of the Charter offers several means to resolve conflicts (negotiation, enquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies or arrangements, or other peaceful means of their own choice). Since the international space law regime does not contain provision related to the settlement of disputes, principles in the Vienna Convention could inspire the legal framework related to the exploitation of space natural resources.

The Vienna Convention provisions constitute a strong set of legal norms to be applied and respected by the international community. However, the Vienna Convention includes self-limitations and has been described as an "unfinished symphony."[66] The total number of States that have ratified it stood at 111 as of November 2010. Sinclair stresses the fact that, globally, the 1969 Vienna Convention has more impact as a codification instrument than as a treaty in the sense that it provides the tools for the elaboration of the law while the Vienna Convention as a treaty itself has less interest. This idea supports the original approach of the proponents of the convention, notably Sir Fitzmaurice, who, in 1955, was the special rapporteur of the ILC's sub-committee on the law of treaties.[67] The content of the convention could also apply on the basis of custom.[68] Despite the foregoing, the convention is considered by most authors as having had (and continuing to have) a real impact on the development of international treaty law since it helps to create new treaties.[69] For Ago, the main "winner" under the 1969 Vienna Convention is the

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[65] *Charter of the United Nations*, 26 June 1945, Can TS 1945 No. 7 art 2.3 [*UN Charter*].
[66] *Sinclair*, *supra* note 5 at 256. Sir Sinclair states that "the Vienna Convention on the Law of Treaties incorporates technical solutions to a number of problems which have long troubled international lawyers […] The major task of the Vienna Conference was however to establish a proper balance between the requirement of security of treaties and the demand for recognition of newly emerging concepts, such as *jus cogens*, which might be destructive of that very security".
[67] *Ibid* at 252 and 3. The main reasons invoked at that time were that, as a code on the law of treaties, the Vienna Convention could not take the form of a treaty, but required an independent basis. At the same time, the content related to enunciations of principles and abstract rules which would fit better in a code.
[68] *Ibid* at 7.
[69] *Ibid* at 252.

international community as the text was adopted between States from very different regions of the world, belonging to different political and economic systems. Ago stresses the fact that the adoption of the 1969 Vienna Convention constitutes recognition and explicit confirmation by the eminent group of legal experts of the pre-existence of a body of customary international law norms.[70] The conclusions drawn by Marcelo G. Kohen[71] go in the same direction: if the goal of codification is to facilitate the establishment of conventional links and support their sustainability, the global assessment is positive. Most of the legal questions to be addressed when dealing with the law of treaties have been covered by the three Vienna Conventions.

2.1.2 SPACE LAW AND CONVENTIONAL LAW:

How did the 1969 Vienna Convention influence the elaboration of the space treaties? How can the convention potentially influence the regime that will govern the exploitation of space natural resources? The Vienna Convention entered into force in 1980, several years after the codification of international space law had already began. However, the principles of the Vienna Convention certainly inspired the preparation of the different space law treaties. Since the Vienna Convention merely codifies and declares existing principles of customary international law,[72] some of its fundamental principles can be found in treaties that were concluded prior to its entry into force.

After the International Geophysical Year (IGY) in 1957, the US Department of State expressed the need to develop international rules to regulate the new activity.[73] While space activities were just commencing, the international community did elaborate a very ambitious set of international resolutions and treaties within the span of a few years. In the first years of space activities, the exploration and use of outer space was not subject to legal norms. Based on existing customary law principles which followed the recognition of existing principles, nations started to work within the framework of the United Nations. The UN naturally appealed to States since it had a universal competence

[70] Roberto Ago, "Droit des traits à la lumière de la convention de Vienne" (1971) 134:III Rec des Cours 328 [Ago].
[71] Marcelo G. Kohen, "La codification du droit des traits: quelques éléments pour un bilan global" (2000) 3 RGDIP 609 [Kohen].
[72] For more information about the historical context of the 1969 Vienna Convention, see Karl Zemanek, "Vienna Convention on the Law of Treaties, Vienna, 23 May 1969" UN website, online: <http://untreaty.un.org/cod/avl/ha/vclt/vclt.html> (date accessed: March 13, 2012) [Zemanek].
[73] Peyrefitte, *supra* note 20 at 14 paragraph 38.

in terms of geography and a global competence from a political point of view.[74] The UN General Assembly created in 1958 the Committee on the Peaceful Uses of Outer Space (COPUOS) which subsequently became the predominant international forum for the elaboration of space law.[75] COPUOS provided a unique forum for the international community to accelerate the codification of principles of space law.[76] Several resolutions were also adopted by the UN General Assembly after the creation of COPUOS.[77] One of the reasons that accounts for the fast and successful codification of space law principles during that era was the then prevailing international political situation and the need to maintain international space security. From an initial total of 18 Member States in 1958, COPUOS presently has a total membership of 70 States.[78]

Other specialized agencies[79] of the UN, such as the International Telecommunication Union (ITU), the United Nations Educational Scientific and Cultural Organization (UNESCO) and the World Meteorological Organization (WMO), were also involved in the codification of space law norms during this era.

As noted above, it was foreseen from the very outset that the Outer Space Treaty would define the key principles governing the conduct of space activities and that each of

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[74] *Ibid* at paragraph 40.
[75] United Nations Office of Outer Space Affairs (UNOOSA) website, online: <http://www.oosa.unvienna.org/oosa/en/COPUOS/cop_overview.html>. The mandate of the Committee was to consider the activities and resources of the United Nations, the specialized agencies and other international bodies relating to the peaceful uses of outer space; international cooperation and programmes in the field that could appropriately be undertaken under United Nations auspices; organizational arrangements to facilitate international cooperation in the field within the framework of the United Nations; and legal problems which might arise in programmes to explore outer space.
[76] Marcoff Sources, *supra* note 46 at 33.
[77] *International Cooperation in the Peaceful Uses of Outer Space*, United Nations General Assembly Resolution 1721(XVI), UNGAOR, 16th Sess, Supp No 17 (1961) [*GA Res 1721(XVI)*]; *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space,* United Nations General Assembly Resolution 1962 (XVIII), of 13 December 1963. UNGAOR, 18th Sess., 1280th Mtg., UN Doc. A/RES/18/1962 (1963). [*GA Res 1962(XVIII)*].
[78] As of January 1st, 2011, the 70 Members of the COPUOS were: Albania, Algeria, Argentina, Australia, Austria, Belgium, Benin, Bolivia, Brazil, Bulgaria, Burkina Faso, Cameroon, Canada, Chad, Chile, China, Colombia, Cuba, Czech Republic, Ecuador, Egypt, France, Hungary, Germany, Greece, India, Indonesia, Iran, Iraq, Italy, Japan, Kazakhstan, Kenya, Lebanon, Libyan Arab Jamahiriya, Malaysia, Mexico, Mongolia, Morocco, Netherlands, Nicaragua, Niger, Nigeria, Pakistan, Peru, Philippines, Poland, Portugal, Republic of Korea, Romania, the Russian Federation, Saudi Arabia, Senegal, Sierra Leone, Slovakia, South Africa, Spain, Sudan, Sweden, Switzerland, Syrian Arab Republic, Thailand, Tunisia, Turkey, the United Kingdom of Great Britain and Northern Ireland, the United States of America, Ukraine, Uruguay, Venezuela & Viet Nam. See UNOOSA website, online: <http://www.oosa.unvienna.org/oosa/COPUOS/copuos.html> (date accessed: March 13, 2012).
[79] Peyrefitte, *supra* note 20 at 16 paragraph 42.

these principles could be further elaborated upon in the frame of a separate treaty as and when the need arose. As a consequence, Peyrefitte considers that the resultant legal construct is not a static one; it is capable of adapting to the future evolution of space activities, taking into account the technical progress that may be achieved along the way.[80]

2.1.3 PARTICULAR CONVENTIONS: MULTILATERAL AND BILATERAL AGREEMENTS.

Several conventions were also negotiated to complement this legal framework. This is notably the case of the space treaties that provide a complete framework for space activities.[81] It is important to mention at this stage the legal framework governing the International Space Station (ISS) elaborated on the basis of an Intergovernmental Agreement (IGA) between the United States, Canada, Europe, Japan and the Russian Federation in 1998.[82] Ten years after the adoption of the first IGA in 1988, and following the admission of Russia into the programme, the final IGA was signed in 1998. It is a unique set of provisions governing the space station on the basis of international space law, with an important adaptation to the particular needs of a space station. This agreement was executed by way of bilateral agreements (memoranda of understanding between the different space agencies) and implementing agreements. To mention only one example, the mechanism relating to intellectual property rights in the ISS required legal adaptation for the European Partner: in the ISS program, Europe is represented as a single partner although it comprises 10 Participating States who are part of the European Space Agency. In order to ensure that claims will not occur in different European

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[80] *Ibid* at 17 paragraph 45.

[81] For all the space treaties, see *Outer Space Treaty,* note 23; *Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, 22 April 1968, 672 UNTS 119, 19 UST 7570, TIAS 6599 [*Rescue and Return Agreement*]; *Convention on International Liability for Damage Caused by Space Objects*, 29 March 1972, 961 UNTS 187, 24 UST 2389, TIAS 7762 [*Liability Convention*]; *Convention on the Registration of Objects Launched into Outer Space*, 12 November 1974, 1023UNTS 15, 28 UST 695, TIAS 8480 [*Registration Convention*]; and *Agreement Governing the Activities of states on the Moon and other Celestial Bodies*, 18 December 1979 1363 UNTS 3, 18 ILM 1434 [*Moon Agreement*].

[82] The full content of the 1998 Inter Governmental Agreement on the ISS, see *Agreement between the United States of America and Other Governments*, January 29, 1998, TIAS 12927 reproduced at the University of Mississippi's National Center for Remote Sensing, Air and Space Law's website, online: <http://www.spacelaw.olemiss.edu/library/space/International_Agreements/Mulilateral/ISS_IGA/1998%20-%20Agreement%20Among%20Canada,%20ESA%20States,%20Japan,%20Russia,%20and%20the%20United.pdf> (date accessed: March 13, 2012) [ISS IGA 1998].

countries, a specific provision was adopted.[83] We can well imagine that another specific international agreement could be prepared in the future in the case of cooperation on a lunar base. The ISS provides an example worthy of emulation.

It is necessary to mention a type of international law as an implementing act of international law: the United Nations General Assembly Resolutions**.** Marcoff refers to international consultation, explaining that parallel to formal agreements, there is in existence a new dimension that was introduced by a mixed procedure of quasi-legislative and quasi-conventional decisions of international organisations, starting with the Resolutions of the UN General Assembly and that this consultation results in the creation of international law.[84] In international space law, UN General Assembly Resolutions have played a great role and continue to do so. Before the elaboration of the UN treaties, several resolutions defined the fundamental principles that were subsequently incorporated into the international conventions. The UN General Assembly Resolution of 13 December 1963[85] was accepted by the US and USSR who considered its terms to be mandatory. That Resolution provided the basis for the subsequent adoption of the Outer Space Treaty.

Up until the 1990's, the role of treaties and international United Nations resolutions as a source of space law was predominant. Since those years, States have been reluctant to modify the existing framework or to elaborate any new conventional rules. The current agenda of the Legal Subcommittee does not foresee the elaboration of any new norms of space law. Many of the items currently on the agenda have remained the same over the last 40 years.[86] The introduction of new agenda items would require the

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[83] See European Space Agency (ESA) website, online: <http://www.esa.int/esaHS/ESAH7O0VMOC_iss_0.html> (date accessed February 12, 2012). See also ISS IGA 1998 *ibid*. Article 21.2 of the ISS IGA provides that, for purposes of intellectual property law, an activity occurring in or on a Space Station flight element shall be deemed to have occurred only in the territory of the Partner State of that element's registry, except that for ESA-registered elements, any European Partner State may deem the activity to have occurred within its territory.

[84] *Marcoff*, *supra* note 19 at 21.

[85] *Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space, infra* note 77 .

[86] The agenda for the 2012 COPUOS Legal Subcommittee session contains the following items:
1. Adoption of the agenda;
2. Election of the Chair;
3. Statement by the Chair;
4. General exchange of views;

achievement of consensus among COPUOS members and, currently, the interests of the COPUOS Member States differ in many respects. Despite the many accomplishments of this international body, underlined by the US during the 50th anniversary of human spaceflight,[87] it has faced a real lack of political impulsion for several decades. As indicated below, these challenges have resulted in the adoption of guidelines and not binding legal norms.

For several decades now, UN General Assembly Resolutions on space matters have been restricted to the mere formality of summarizing, recording and acknowledging the work of COPUOS.[88] The non-adoption of any new treaties is also attributable to the complete lack of political will on the part of States to pursue the development of new legal norms within the Legal Subcommittee of COPUOS. Several States have systematically refused to agree to the introduction of new items into the agenda of COPUOS. As indicated above, the status of the Moon is presently being discussed by a Working Group of the Legal Subcommittee of COPUOS. The discussion has not reached

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5. Status and application of the five United Nations treaties on outer space;
6. Information on the activities of international intergovernmental and non-governmental organizations relating to space law;
7. Matters relating to:
(a) The definition and delimitation of outer space;
(b) The character and utilization of the geostationary orbit, including consideration of ways and means to ensure the rational and equitable use of the geostationary orbit without prejudice to the role of the International Telecommunication Union;
8. Review and possible revision of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space;
9. Examination and review of the developments concerning the draft protocol on matters specific to space assets to the Convention on International Interests in Mobile Equipment;
10. Capacity-building in space law;
11. General exchange of information on national mechanisms relating to space debris mitigation measures;
12. General exchange of information on national legislation relevant to the peaceful exploration and use of outer space;
13. Proposals to the Committee on the Peaceful Uses of Outer Space for new items to be considered by the Legal Subcommittee at its fifty-second session.
See UNOOSA website, online at <http://www.oosa.unvienna.org/pdf/limited/c2/AC105_C2_L285E.pdf> (date accessed: March 13, 2012).

[87] See notably statement made by Kenneth Hodgkins, US Advisor, on Agenda Item 51: International Cooperation in the Peaceful Uses of Outer Space, at the Fourth Committee, US mission to the United Nations website, online <http://usun.state.gov/briefing/statements/2011/175244.htm> (date accessed: March 13, 2012):
COPUOS's work was critical to the development of the major space treaties that underpin our space activities today. This work continues as the Committee adopts new agenda items to address our evolving and expanding use of space into the future. COPUOS's success is testimony both to the international coalition that brought it into existence and the commitment of its member states to its essential mission.

[88] *Marcoff*, *supra* note 19 at 80.

the point where a new agenda item will be created. These developments have significant implications for the present study: a decision on an international convention to govern the exploitation of space natural resources seems difficult to reach within the current international context.

2.2 NON-CONVENTIONAL LEGAL NORMS

International custom is the second main source of international law. Article 38(1)(b) of the Statute of the International Court of Justice describes international custom "as evidence of a general practice accepted as a law."[89] Although in the hierarchy of sources of law, Article 38 places international custom second after treaties, this does not mean that it is of less importance. International custom is applicable to all States as part of general international law. It has a consensual nature. International custom traditionally consists of two elements[90]: State practice and the *opinio juris*. State practice is the objective element and depends on the duration, the uniformity, and consistency of the practice, as well as its generality. Universality is not necessary in the case of customary law. *Opinio juris* is the subjective element. It implies an acceptance by all States. As underlined by Scelle, the advantages of international custom are its "spontaneous character" and adaptability to change.[91] While conventional international law is predominant in the contemporary world, the existence of customary law cannot be underestimated.

Prior to being codified as conventional norms, many of the fundamental principles of space law had first emerged as international custom. For instance, the principle of freedom of exploration and use of outer space emerged from the behaviour of States, notably the fact that non-space faring nations did not react or express any opposition to the space activities carried out by the US and USSR. In the frame of the famous Bogota convention, eight equatorial States issued a Declaration in 1976 asserting claims to

[89] *Statute of the International Court of Justice*, *supra* note 49 art 38(1)(b).
[90] *Marcoff*, *supra* note 19 at 123.
[91] *Scelle*, *supra* note 45 at 421. "Il est naturel d'ailleurs que dans les sociétés internationales où les fonctions sociales demeurent souvent indifférenciées, la coutume reprenne, comme dans les sociétés primitives, un cham d'action extrêmement large. Son caractère spontané et intuitif, sa malléabilité, lui permettent de s'adapter aux changements incessants des circonstances sociales."

portions of the geostationary orbit.[92] They qualified the geostationary orbit as a natural resource and claimed sovereignty over this orbit, asking for a delimitation of outer space. Despite this initiative, the delimitation of outer space has not been addressed under international law, not even by customary law. This topic has been on the agenda of the Legal Subcommittee for about half a century yet consensus has not been achieved among COPUOS member states.[93]

Sinclair discusses the link between the 1969 Vienna Convention and customary international law. He highlights a few provisions of the Vienna Convention to illustrate his views.[94] In particular, Sinclair discusses article 3 concerning international agreements not within the scope of the Vienna Convention, which states that:

> The fact that the present Convention does not apply to international agreements concluded between States and other subjects of international law or between such other subjects of international law, or to international agreements not in written form, shall not affect:
>
> (a) the legal force of such agreements;
>
> (b) the application to them of any of the rules set forth in the present Convention to which they would be subject under international law independently of the Convention ….

In the famous 1969 *North Sea Continental Shelf* cases, the International Court of Justice developed the conditions - not met in this specific case - upon which a convention can generate rules that are accepted as part of international customary law. According to the Court, the conventional norm must be a norm-creating provision which has generated a rule which, while only conventional or contractual in its origin, has since passed into the general *corpus* of international law...." The norm is now accepted as such by the *opinio*

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[92] For the full text of the Bogota declaration, see Japan Aerospace Exploration Agency (JAXA) website, online: <http://www.jaxa.jp/library/space_law/chapter_2/2-2-1-2_e.html> (date accessed: March 13, 2012). A number of equatorial countries declared that the geostationary synchronous orbit is a physical fact linked to the reality of our planet because its existence depends exclusively on its relation to gravitational phenomena generated by the earth, and that is why it must not be considered part of outer space. Therefore, segments of the geostationary synchronous orbit are part of the territory over which equatorial states may exercise national sovereignty. The geostationary orbit is a scarce natural resource the importance and value of which increases rapidly along with the development of space technology and with the growing need for communication; therefore, the Equatorial countries meeting in Bogota decided to proclaim and defend on behalf of their peoples, the existence of their sovereignty over this natural resource. The geostationary orbit represents a unique facility that it alone can offer for telecommunication services and other uses which require geostationary satellites.

[93] *Marcoff*, *supra* note 19 at 72.

[94] *Sinclair*, *supra* note 5 at where is the author refers to articles 3(b), 4, 38 and 43.

juris, so as to become binding even for States which have never, and do not, become parties to the Convention … and "it constitutes indeed one of the recognized methods by which new rules of customary international law may be formed."[95] It is interesting to note that, with this judgment, the ICJ considers that a treaty can be the source of customary international law. This objectivist approach considers that the formation of international custom can also answer to more sociological aspects, far from the pure voluntarism approach or when the convention has a universalist purpose (as it was the case for art 6 of the 1958 Geneva Convention regarding the continental shelf).[96]

In space activities, several rules of customary international law emerged from the absence of reaction from the international community in the late 1950's and early 1960's following the launch of space objects by the US and the USSR. The customary international law rules that emerged include the fundamental principle of non-appropriation of outer space by States, and its corollary principle of freedom of exploration and use of space. They applied to the non-tangible resources of space, basically the orbits. Considering the activities that were taking place at that time and the guarantees granted by the scientific authorities, the peaceful use of outer space also became an international custom.[97] There is very little State practice in the exploitation of space natural resources. With the exception of a few sample collection missions, the exploitation of space natural resources for commercial purpose has not yet commenced. Considering the commercial interest in this activity, should activities start without clear rules it will very likely be conducted for purely commercial interest.

Finally, it is necessary to mention the general principles of law commonly recognized by the major legal systems of the world as a source of international law. Article 38(1)(c) of the Statute of the ICJ establishes "general principles of law recognized by civilized nations" as the third source of international law. The *Jus cogens* could be defined as "the body of those general rules of law whose non-observance may affect the very essence of the legal system to which they belong to such an extent that the subject of

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[95] *North Sea Continental Shelf Cases (Federal Republic of Germany v. Denmark; Federal Republic of Germany v. Netherlands)* , International Court of Justice (ICJ), 20 February 1969UNHCR online: <http://www.unhcr.org/refworld/docid/4023a4c04.html> (date accessed: June 26, 2012).
[96] *Dailler, supra* note 2 at 354 paragraph 208 and 356 paragraph 209.
[97] *Peyrefitte, supra* note 20 at 42.

law may not, under pain of absolute nullity, depart from them in virtue of particular agreements."[98] Article 53 of the Vienna Convention, titled: Treaties conflicting with a peremptory norm of general international law ("jus cogens"), states that "A treaty is void if, at the time of its conclusion, it conflicts with a peremptory norm of general international law …."[99] A peremptory norm of general international law is defined in the same article as: "a norm accepted and recognized by the international community of States as a whole as a norm from which no derogation is permitted and which can be modified only by a subsequent norm of general international law having the same character." Sinclair considers *jus cogens* as "a superior order of legal prescription from which States are not free to derogate by treaty" reminding us about the debate between naturalists and positivists. However, this concept has not been used much by tribunals. For Sinclair, *jus cogens* remains an important principle since "if it is developed with wisdom and restraint in the overall interest of the international community it could constitute a useful check upon the unbridled will of individual States."[100]

General principles of law have influenced the elaboration of space law. Space law principles are part of international law and, as such, constitute international legal norms. Some space law principles emerged as a result of a simple transposition of principles of international law. This was notably the case with regard to the principles of sovereignty of States in space, equality of States, and non-aggression. Other space law principles were in existence before their codification.

Finally, article 38(1)(d) of the Statute of the ICJ mentions the "judicial decisions and the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law." Space law has not featured prominently in many of the cases brought before the courts. However, scholars have played (and continue to play) a significant role in the elaboration of space law.

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[98] *Sinclair*, *supra* note 5 at 203, referring to Eric Suy in *The Concept of Jus Cogens in International Law*, in 2 The Concept of Jus Cogens in International Law 17, 18-22 (Carnegie Endowment for International Peace, 1967).
[99] *VCLT*, *supra* note 59 art 53.
[100] *Sinclair*, *supra* note 5 at 223.

III. CONTEMPORARY LEGAL SYSTEMS AND THEIR IMPACT ON INTERNATIONAL LAW

1. GENERAL INTERNATIONAL LAW AND CODIFICATION TODAY

International law has further evolved and developed in view of the multiplication of States on the international scene. Contemporary evolution was characterized by the emergence of the notion of international community and the development of *soft law*".

1.1 DEVELOPMENT OF THE INTERNATIONAL COMMUNITY/GLOBALISATION – NEW INTERNATIONAL ORDER

Over the last 50 years, contemporary society has moved from a bipolar system to a new equilibrium between the West, the East and developing countries. With the Cold War coming to an end, a new international community has emerged in which emerging economies have played (and continue to play) an increasingly important role. Writing in 1983, Virally[101] stressed that the nature of international law is being changed by an ideological evolution of the international society. As noted by Judge Manfred Lachs,[102] this is an old notion that started with developments in the League of Nations. It became a reality after the Second World War and the creation of the United Nations. Lachs emphasizes the fact that there is a need to have a threshold between legal obligations and other obligations which have no legal value.

Since the middle of the 20th Century, there has been a multiplication of multilateral agreements having universal objects. Over the last twenty years, the agreements signed have dealt with human rights,[103] terrorism and organised crime,[104]

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[101] Michel Virally, "Panorama du droit international contemporain", (1983) 5 Rec des Cours 183 [Virally].
[102] Manfred Lachs, "Quelques réflexions sur la communauté internationale", in Michel Virally, *Le droit international au service de la paix, de la justice et du développement* (Paris: Editions Pédone, 1991) at 350-351 [Lachs].
[103] For international agreements concluded on human rights, see: The Optional Protocol to the International Covenant on Economic, Social and Cultural Rights (New York, 10 December 2008), Doc. A/63/435 and the Optional Protocol to the Convention on the Elimination of All Forms of Discrimination against Women (New York, 6 October 1999), Doc. A/RES/54/4.
[104] For international agreements concluded on terrorism: see The International Convention for the Suppression of the Financing of Terrorism (New York, 9 December 1999), Doc. A/RES/54/109. Protocol to Prevent, Suppress and Punish Trafficking in Persons, Especially Women and Children, supplementing the United Nations Convention against Transnational Organized Crime (New York, 15 November 2000), Doc. A/55/383 and the International Convention for the Suppression of Acts of Nuclear Terrorism (New York, 13 April 2005), A/RES/59/290.

disarmament,[105] the terrestrial environment[106] and outer space. The result of this evolution is the coming into existence of a community which is beyond the multilateral relations between States.[107]

The notion of international community is recognized in article 53 of the 1969 Vienna Convention on the Law of Treaties.[108] As stressed by Lachs, the notion of international community is also implicit in the "common heritage of mankind" concept as used in the law of the sea and in space law. Contemporary international law was also characterized by the development of *soft law*.

1.2 THE ROLE OF SOFT LAW

Beginning from the end of the 1960's, the term "soft law" has defined a new approach in international law making. It was originally used by Lord McNair to explain the law formulated by proposals or principles and not by binding terms - "hard law."[109] It is interesting to note that the notion of soft law, which is difficult to clearly define, has been the subject of heavy criticism. The legal framework is not restricted to norms applicable by a tribunal. For Abi-Saab,[110] there can be intermediate steps in the construction of a norm. The interest of *soft law* is mainly due to its flexibility to apply in situations where a codified norm cannot. Abi-Saab explains that *soft law* can play a significant role in the elaboration of the law; it expresses a legislative intention without the mandatory effect of a classic international norm. The purpose of soft law is not to

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[105] For international agreements concluded on disarmament: see The Comprehensive Nuclear-Test-Ban Treaty (New York, 10 September 1996), Doc. A/50/1027 and the Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their destruction (Oslo, 18 September 1997), Doc. A/Res./52/38.

[106] For international agreements concluded on the environment: see the Stockholm Convention on Persistent Organic Pollutants (Stockholm, 22 May 2001), the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity (Nagoya, 29 October 2010) and and the Nagoya - Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety (Nagoya, 15 October 2010).

[107] *Dupuy*, *supra* note 1 at 418 paragraph 404.

[108] *VCLT*, *supra* note 59 art 53:
A treaty is void if, at the time of its conclusion, it conflicts with a peremptory norm of general international law. For the purposes of the present Convention, a peremptory norm of general international law is a norm accepted and recognized by the international community of States as a whole as a norm from which no derogation is permitted and which can be modified only by a subsequent norm of general international law having the same character.

[109] Georges Abi-Saab, *Eloge du "droit assourdi", quelques réflexions sur le rôle de la soft law en droit international contemporain*, (Bruxelles: Editions Bruylant, 1993) at 60 [*Abi-Saab*].

[110] *Ibid*.

replace hard law norms but rather to complement them. Soft law can also constitute the final product. In both cases, *soft law* does produce legal effects.[111] Abi-Saab stresses the fact that in and of itself, *soft law* can be a specific type of law, what he calls "a deaf law".[112] This phenomenon is directly linked to the multiplication of organizations, both universal and regional, following the end of the Cold War and the increasing number of States on the international scene.[113]

To illustrate the foregoing, international environment law is traditionally mentioned as being the field where such an approach was heavily used in the elaboration of *soft law* by different organizations. Several important Declarations were drafted under the auspices of the United Nations Environment Program (UNEP):[114] the 1972 Declaration of the United Nations Conference on the Human Environment ("Stockholm Conference"); the 1978 UNEP Draft Principles of Conduct in the Field of the Environment for the Guidance of States in the Conservation and Harmonious Utilization of Natural Resources Shared by Two or More States; and, the 1992 Rio Declaration on Environment and Development, reaffirming the 1972 conference.

As seen above, there is no uniform type of soft law instrument. *Soft law* may take many different forms - Recommendation, Directive, Declaration, etc. A norm may be considered to be soft law either because the form, or the content, or both, are soft. As stressed by Dupuy,[115] when negotiating soft law instruments, delegations work as if they were preparing treaty provisions. However, the existence of soft law cannot simply be deducted from the existence of such texts. The elaboration of soft law requires repetition. While a convention produces a legal effect after its ratification and entry into force, the

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[111] *Abi-Saab*, s*upra* note 109 «la *soft law* sert ainsi de curseur et de locomotive dynamique au processus cumulatif du développement du droit et jalonne ses étapes à travers la zone grise.»

[112] *Supra* note 109 «la s*oft law* est ni du non-droit ni une *lex imperfecta*. Elle n'est pas non plus toujours et nécessairement un droit en gestation, car il peut s'agir également d'un droit différent, ou d'une variété de droit qui remplit une fonction différente de celle du droit «limite»: non pas le droit cassant du justicier ou du gendarme, mais celui, plus discret et malléable, de l'architecte social, auquel sied à la perfection la dénomination «droit assourdi».

[113] Pierre-Marie Dupuy, "Soft Law and the International Law of the Environment" (1990-1991) 12 Mich J Int'l L 420 [Dupuy, Soft Law].

[114] *Declaration of the United Nations Conference on the Human Environment*, Stockholm, June 16 1972, UN Doc. A/CONF.48/14/Rev.1 at 3 (1973) and *Rio Declaration on Environment and Development*, UN Doc. A/CONF.151/5/Rev.l (1992).

[115] Pierre-Marie Dupuy, *Après la guerre du Golfe*, in Revue Générale de Droit International Public, 1991 at 631.

process is different in the case of soft law. Several factors may be taken into account to identify the existence of a *soft law* norm: "the source and origin of the text (governmental or not); the conditions, both formal and political, of its adoption; its intrinsic aptitude to become a norm of international law; and the practical reaction of States to its statement."

2. SPACE LAW DYNAMIC

2.1 SPACE LAW, AN ORIGINAL BRANCH OF INTERNATIONAL LAW

International space law does modify general international law by transforming or introducing several principles, notably: the non-appropriation principle, the freedom of use principle, the humanist dimension, and the common heritage of mankind. As discussed in Part I of this dissertation, these rules are still in force and they grant this sector of international law a special character which enables space law to maintain its status as a specialized autonomous branch of international law.[116] At the beginning of the 1960's, space activities revolved exclusively around the relationship between States. An important set of space law binding rules has been adopted so far and they have not been significantly modified over the last four decades. The efficient and fast work of codification of space law principles made after the launch of Sputnik was closely linked to the then prevailing international political situation created by the Cold War, and the interest of the different Parties to develop a legal framework capable of protecting each other's interests.

Today, the role played by the UN in terms of codification of space law principles is extremely limited. The difficulty stems from a lack of political will on the part of the space powers combined with the consensus rule that applies to decision-making in the COPUOS. Governments remain reluctant to see the emergence of an international authority dealing with too delicate subjects (delimitation of outer space and space debris for example while commercial exploitation of space natural resources certainly can be included). Marcoff supports the idea of an increasing role of the consensus rule and, in parallel, the decrease of the normative and creative function of resolutions. With the modification of contemporary society, the traditional contractual approach is evolving. Less formal means of international law formation have emerged - regional groups want to

[116] Marcoff Sources, *supra* note 46 at 30.

be heard. Within the Legal Subcommittee of COPUOS, this has certainly been the case with the emergence of blocs of countries such as Group of Latin America and Caribbean Countries (GRULAC). Finally, as discussed in chapter II above, the private sector has played an increasingly important role over the last few decades.

Considering the importance of space natural resources for future generations, there is the risk that the non-existence of binding rules of law will lead to a "first come first served" regime of exploitation which will be detrimental to the future of international relations between States.

2.2 MAIN DEVELOPMENTS IN CONTEMPORARY INTERNATIONAL SPACE LAW

COPUOS has failed to elaborate any new and/or significant legal norms since the last UN resolutions were adopted in the 1990's (i.e., the Principles Relevant to the Use of Nuclear Power Sources in Outer Space in 1992 and 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 in 1996).

The Inter-Agency Space Debris Coordination Committee (IADC) was created in order to address the problem of space debris. Its main object was to facilitate the exchange of information between the relevant agencies in order to facilitate cooperation in debris research and identify debris mitigation options.[117] It was not until UNISPACE II (1982) that the problem was addressed at the international level.[118] Space debris only became an agenda item of the Scientific and Technical Subcommittee (STSC) of COPUOS in 1994.[119] Space debris mitigation Guidelines were first adopted at the level of the IADC. It took thirteen additional years before the same Guidelines were approved at the international level by COPUOS.[120] This occurred in 2007, three years after the

[117] See IADC website, online: <http://www.iadc-online.org/index.cgi?item=home> (date accessed: March 13, 2012).
[118] Ram Jakhu, "Legal issues of satellite telecommunications, the geostationary orbit, and space debris" (2007) 5 Astropolitics 173.
[119] Niklas Hedman, "COPUOS and Space Debris", Presentation made at the International Interdisciplinary Congress on Space Debris 7-9 May 2009, McGill University, Montreal, Canada, McGill website, online <http://www.mcgill.ca/files/iasl/Session_2_Niklas_Hedman.pdf> (date accessed: March 13, 2012) [Hedman].
[120] International Cooperation in the Peaceful Uses of Outer Space, United Nations General Assembly. Doc A/RES/63/90 of 5 December 2008:

Guidelines had been endorsed by the STSC.[121] As a condition to proceeding with the adoption of the Guidelines by COPUOS, it was decided that they would not be discussed at the Legal Subcommittee (LSC).[122] Instead, the LSC introduced a new agenda item titled "general exchange of information on national mechanisms relating to space debris mitigation measures."[123] The length of time it took to reach consensus at COPUOS on the guidelines shows the difficulties it raised for space agencies and governments.

A Working Group on space debris was established by the COPUOS STSC to develop recommended guidelines. Member States have absolute discretion to implement the guidelines on a voluntary basis. They are applicable to newly designed spacecraft and orbital stages. The content of the Guidelines reflects the fundamental mitigation elements of a series of existing practices, standards, codes and handbooks developed by national and international organizations. The guidelines contain the following key principles: limit debris released during normal operations; minimize the potential for break-ups during operational phases; limit the probability of accidental collision in orbit; avoid intentional destruction and other harmful activities; minimize potential for post-mission break-ups resulting from stored energy; limit the long-term presence of spacecraft and launch vehicle orbital stages in the low Earth orbit (LEO) region after the end of their mission and limit the long-term interference of spacecraft and launch vehicle orbital stages with the geosynchronous Earth orbit (GEO) region after the end of their mission.

Notes with appreciation that some States are already implementing space debris mitigation measures on a voluntary basis, through national mechanisms and consistent with the Space Debris Mitigation Guidelines of the Inter-Agency Space Debris Coordination Committee and with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, endorsed by the General Assembly in its resolution 62/217.
Invites other Member States to implement, through relevant national mechanisms, the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space
Considers that it is essential that Member States pay more attention to the problem of collisions of space debris, including those with nuclear power sources, with space debris, and other aspects of space debris, calls for the continuation of national research on this question, for the development of improved technology for the monitoring of space debris and for the compilation and dissemination of data on space debris, also considers that, to the extent possible, information thereon should be provided to the Scientific and Technical Subcommittee, and agrees that international cooperation is needed to expand appropriate and affordable strategies to minimize the impact of space debris on future space missions.

[121] Report of the Scientific and Technical Subcommittee on its 44th session, UN Doc. A/AC.105/890 of 6 March 2007.

[122] This condition does not appear in any of the reports, but was part of the author's impression of the proceedings at the COPUOS.

[123] See Hedman, *supra* note 119.

These international guidelines are not binding under international law. They sit on top of existing mechanisms in some countries and they provide a good starting point for those not having any type of debris mitigation rules in place at all. Ultimately, there is not in existence any one set of provisions applicable to all nations: national mechanisms coexist with the international guidelines, the former being harmonised by the latter.

It is difficult to say precisely what the experience has been like after only few years of application. The main objective of the Guidelines is clearly to encourage space faring nations to observe a number of measures designed to mitigate the generation of space debris during the conduct of space activities. However, there is no mechanism to supervise who does what or whether the guidelines are being followed, and there are no sanctions for breach. The IADC guidelines, endorsed at the level of space agencies, were adopted after years of discussions by governments in the frame of COPUOS and the final text is the pure product of UN consensus. Although it is a major achievement, one cannot help but wonder if it will be sufficient in the coming years. Governments could have used those years to prepare a document having more legal weight. The same type of problem exists in connection with the development of a legal framework to govern space natural resources. A very few authors[124] have started to make the claim that there is the need for an international agreement in the case of the space debris. The question of space debris is one of the most recent topics addressed at the UN. An observation of what is being done with respect to other issues is essential for purposes of analyzing what is the most relevant way to define a framework to govern the exploitation of space natural resources.

IV. CONCLUSION

What type of legal framework would be most appropriate to regulate the potential exploitation of space natural resources?

There is the need to take into account modern international law as well as the political dimension of the subject in order to determine what type of legal framework would be most suited to govern the exploitation of space natural resources. The statement

[124] See Thierry Sénéchal, "Space debris pollution: a convention proposal" [unpublished] online at <http://www.pon.org/downloads/ien16.2.Senechal.pdf> (date accessed: March 13, 2012) [Sénéchal].

made by Lachs in 1972 is still relevant today: "the new branch known as the law of outer space must reflect the most progressive tendencies of international law. It must be directed towards the future, not to a world that has been left behind. Hence, when resorting to analogies, account must be taken of the most recent developments in international law as a whole."[125] In this regard, analogies may be drawn from environmental law as well as air law. The strong legal framework that characterizes the field of air law was made possible with the adoption of international conventions such as: the 1944 Convention on International Civil Aviation (Chicago Convention) and the 1929 Warsaw Convention.[126]

An international treaty is the only suitable solution for the international governance of space natural resources exploitation. Multilateral treaties have become the most efficient means to create new binding international rules and the codification work is also needed in areas of international law where there are very few or no customary rules.[127] There is the need for a solid and versatile regime to cater for the interests of both present and future generations. An international treaty has the advantage of ensuring a wide buy-in through negotiations. The binding character of the text will give such a treaty clarity and legal certainty. This is even more important given that exploitative activities will occur in an area that is difficult to access and supervise. If a new text was to be adopted on the same subjects covered by the Moon Agreement, it would supersede the

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[125] Manfred Lachs, *The Law of Outer Space*, 1972, Sijthoff, Leiden at 21, cited by IHPh Diederiks-Verschoor, "The impact of space law on general international law", *Proceedings of the 17th Colloquium on the Law of Outer Space*, (Herndon VA: AIAA/IISL, 1973) at 5.

[126] International Civil Aviation Organization (ICAO), *Convention on Civil Aviation ("Chicago Convention")*, 7 December 1944, (1994) 15 U.N.T.S. 295, available at: <http://www.unhcr.org/refworld/docid/3ddca0dd4.html> (date accessed: June 26, 2012) and International Civil Aviation Organization (ICAO), *Convention for the Unification of certain Rules relating to International Carriage by Air (Warsaw Convention) (as amended at the Hague, 1955, and by Protocol No. 4 of Montreal, 1975)*, 12 October 1929, available at: <http://www.unhcr.org/refworld/docid/48abd581d.html > (accessed 26 June 2012).

[127] Kohen, *supra* note 71 at 610 where the author notes:
En droit international, le rapport entre la convention codificatrice et la coutume est différent. Il ne consiste pas à abroger la coutume, mais il ne s'agit pas non plus de la transcrire simplement par écrit. La codification du droit international a pour vocation d'exprimer la coutume en vigueur et en même temps celle en devenir. Cette dernière notamment dans des domaines où il n'y a pas suffisamment de pratique ou pas de pratique du tout.

provisions of the Moon Agreement if all the parties thereto become parties to the new treaty, as per article 30 of the 1969 Vienna Convention on the Law of Treaties.[128]

While the international community focused on the development of customary law during the first few decades following the emergence of international law, Marcoff considers that the more active role of the conventional procedure in recent times appears to be a criterion that reveals a social evolution and also shows political integration within the international community.[129]

Before setting up the new rules, it is important to review the current status of ratifications of both the Outer Space Treaty and the Vienna Convention. A comparison of the status of ratification of the two agreements establishes the following: 98 States are party to the Outer Space Treaty[130] while there are 27 other signatories that have not ratified it; 111 States are party to the Vienna Convention.[131] It is interesting to note that India, Israel, South Africa and France - countries that are actively conducting space activities - belong to the group of countries that have ratified the Outer Space Treaty but not the Vienna Convention. For those countries, the role of customary international law could be important.

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[128] *VCLT*, *supra* note 59 art 30: Application of successive treaties relating to the same subject matter.
1. Subject to Article 103 of the Charter of the United Nations, the rights and obligations of States Parties to successive treaties relating to the same subject matter shall be determined in accordance with the following paragraphs.
2. When a treaty specifies that it is subject to, or that it is not to be considered as incompatible with, an earlier or later treaty, the provisions of that other treaty prevail.
3. When all the parties to the earlier treaty are parties also to the later treaty but the earlier treaty is not terminated or suspended in operation under article 59, the earlier treaty applies only to the extent that its provisions are compatible with those of the later treaty.
4. When the parties to the later treaty do not include all the parties to the earlier one:
(*a*) as between States Parties to both treaties the same rule applies as in paragraph 3;
(*b*) as between a State party to both treaties and a State party to only one of the treaties, the treaty to which both States are parties governs their mutual rights and obligations.
5. Paragraph 4 is without prejudice to article 41, or to any question of the termination or suspension of the operation of a treaty under article 60 or to any question of responsibility which may arise for a State from the conclusion or application of a treaty the provisions of which are incompatible with its obligations towards another State under another treaty.
[129] Marcoff Sources, *supra* note 46 at 31.
[130] For the current status on ratifications of the 1967 Outer Space Treaty, see UNOOSA website, online: <http://www.oosa.unvienna.org/oosatdb/showTreatySignatures.do?statusCode=PARTY&d-8032343-p=1&treatyCode=OST&stateOrganizationCode=> (date accessed: March 13, 2012).
[131] For the status on ratifications of the 1969 VCLT, see UN website, online: <http://treaties.un.org/Pages/ViewDetailsIII.aspx?&src=TREATY&mtdsg_no=XXIII~1&chapter=23&Temp=mtdsg3&lang=en> (date accessed: March 13, 2012).

What content will be appropriate for this new regime that will govern the exploitation of space natural resources? Two types of provisions[132] are necessary: first, the technical clauses needed to ensure that the convention will have effect (i.e., the parties, date of conclusion, aim, rights and obligations of the parties, dispute settlement, entry into force modalities, revision, withdrawal); and, secondly, the substance of the convention. The remainder of this dissertation will focus on the content of the second part, the legal substance. A legal analysis is required to define the minimum requirements. Analogies are drawn from the Law of the Sea and the Antarctic, the objective being to analyze the solutions identified for the management of natural resources in these international areas, to identify and highlight the drawbacks to be avoided as well as any positive provisions or practices that are capable of adaptation for use in the proposed regime to govern the exploitation of space natural resources.

[132] *Dupuy*, *supra* note 1 at 283 paragraph 234, recalling P. Reuter and stressing that these two aspects are complementary and not dissociable, constituting useful characters in some cases.

CHAPTER V – THE SEA AND ANTARCTIC MODELS: A COMPARATIVE APPROACH

I. INTRODUCTION

The search for a legal framework to govern the exploitation of space natural resources now requires moving to the next step. Chapter IV concludes by proposing that an international treaty would most likely be the best approach. With regard to the substantive legal content of this regime it is proposed to proceed by way of drawing analogies from the international regimes established for resources exploitation in the Sea and in Antarctica. A cursory look at the geographical and physical characteristics as well as the political challenges associated with resource exploitation in each of these areas shows that there are many similarities between all three international areas. For instance, the High Seas, Antarctica, and outer space are all characterized by the absence of State sovereignty.

Data provided by Environment Canada[1] suggests that about 1.4 billion square kilometres (approximately 70%) of the Earth's surface is covered by water.[3] The oceans contain 97% of the planet's water while 95% of the underwater world remains unexplored.[2] The Sea has been the object of legal challenge for many centuries. In the early stages of marine navigation, the political challenges over the Sea were focused on the right of navigation. In the 20th century, the concern shifted to marine resources, both mineral and living resources. As in space, the resources of the high seas are not well known and require further exploration.

Antarctica is a very hostile environment. All but 2% of that continent is covered by ice all year round.[3] Antarctica and space are considered as the "environments of extremes."[4] Access to Antarctica is difficult and it was not until the 20th Century that mankind commenced exploration of this continent. Due to the fact that it is difficult to

[1] See Department of Environment, Canada, "How much do we have", Environment Canada website, online <http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=51E3DE0C-1> (date accessed: March 13, 2012).
[2] US National Oceanic and Atmospheric Administration (NOAA), "Ocean" NOAA website online <http://www.noaa.gov/ocean.html> (date accessed: March 13, 2012).
[3] Chuck Stovitz & Tracy Loomis, "Space Law: Lessons learned from the Antarctic" *Proceedings of the 28th Colloquium on the Law of Outer Space*, (Herndon, VA: IISL/AIAA, 1985) 165 [Stovitz & Loomis].
[4] J Malenovsky, "The Antarctic Treaty System - A Suitable Model for The Further Development of Space Law" *Proceedings of the 31st Colloquium on the Law of Outer Space*, (Herndon, VA: IISL/AIAA, 1988) 312 [Malenovsky].

establish permanent settlements in Antarctica and in Outer Space, scientific investigations are carried out by international teams who rotate in and out of both areas from time to time.[5] Large amounts of funding are required for purposes of exploration of these areas. It is important to have in mind the geographical distinction between the Arctic in the North, (which is not the subject of a dedicated international convention) and Antarctica in the South, which is discussed in this chapter. The Arctic is a frozen sea surrounded by territories, while Antarctica is a continent in the middle of oceans.[6] Antarctica was considered as a test bed for space exploration due to its geographical location, difficult access and hostile environment. Space scientists have used this area as a laboratory to test equipment and infrastructure, as well as human resistance to long-duration flights.[7]

The economic powers that are present in Antarctica are also present in outer space. There is a clear parallel between the interests of those countries in Antarctica and in its natural resources - national interests in this area are not limited to scientific exploration. However, unlike outer space, Antarctica has been the subject of national claims or reserved rights. Seven countries (Argentina, Australia, Chile, France, New Zealand, Norway and United Kingdom) have claimed territorial sovereignty over portions of the continent. Permanent stations were established in Antarctica in the middle of the 20th Century: the United States has a base at Amundsen-Scott at the South Pole; Russia in Vostok and France the Dumont-Urville base in Adelie. China is planning to build a station at about 4000 meters altitude. Analogies drawn from Antarctica and the High Seas are of great relevance to outer space and its natural resources given the similarity of geographical characteristics. Coincidentally, all three areas have been dealt with using the notion of commons.

The next section of this chapter discusses the evolution of the notion of commons from the perspective of the exercise of property rights in an international area. The section that follows presents a comparative analysis of the fundamental principles of the Antarctic Treaty System and the Law of the Sea. Finally, the last section provides a

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[5] *Ibid*.
[6] Sébastien V. Grevsmühl. Antarctique et espace: fin et suite de la géographie, in *L'Information géographique,* 2/2010 (Vol. 74). L'espace en jeu, juin 2010, at 115.
See also Stephen J. Pyne, "The extraterrestrial Earth: Antarctic as analogue for space exploration" (2007) 23 Space Policy 147.
[7] *Malenovsky, supra* note 4.

comparative analysis of the two regimes focusing specifically on how they address resources exploitation in order to draw some potential conclusions for the present study.

II. THE NOTION OF THE COMMONS: ITS EVOLUTION AND IMPACT FOR SPACE NATURAL RESOURCES

The objective of the present section is to look at the evolution of the notion of common property or resources since it is relevant to the three international areas studied in this chapter. The aim is to determine if there are legitimate ways to acquire property rights and exploit the resources of a global commons without appropriation of the territory. Before discussing the negotiating history of the Law of the Sea and the Antarctic Treaty System, this section discusses the legal theory of property from a historical context.

1. LEGAL THEORY HISTORICAL CONTEXT IS RELEVANT FOR THE STUDY

A synthetic approach of legal theory historical context will be outlined in order to see whether the future regime on exploitation of space natural resources could be inspired by history.

The notion of property[8] exists in all societies. In Roman law, the notion of property was initially linked to the role of the father. In the Middle Ages, it was linked to the Lord while, in our contemporary society, private property is considered a fundamental right.[9] Property prescribes rights and interdictions; it is a faculty and at the same time an interdiction to act on things. It is the political relations that is created between men and rules the way to dispose of things.[10] In their time, Locke, Marx and Rousseau developed unique theoretical views on the role of nature and the place of property. For Locke, men are free by nature; they live in the "state of nature" and must respect the law of nature. "[...] men, being once born, have a right to their preservation, and consequently to eat and

[8] For a historical view of the notion of property, see Jean-Louis Halpérin, *Histoire du droit des biens*, (Economica, 2008) at 1-18 [*Halpérin*].
[9] Guy Mercier, "Prémisses d'une théorie de la propriété", (1986) 30:81Cahiers de géographie du Québec, 319-341, Université Laval website, online: <http://www.erudit.org/revue/cgq/1986/v30/n81/021813ar.pdf> (date accessed: March 13, 2012) [Mercier].
[10] *Ibid* at 321. Based on several sources, the author notes:
La propriété, à titre de règle sociale, prescrit « certaines forme de conduits, et en interdit d'autres sous peine de répression, de sanctions ». «La loi de la propriété consacre à la fois une faculté et une interdiction d'agir sur les choses ». « la propriété est donc la relation politique qui se noue entre les hommes et qui règlemente la façon de disposer des choses »

drink, and such other things as nature affords for their subsistence."[11] Men can appropriate what they find in nature as long as they need it for their labour. Property is based on a man's work to satisfy his needs. Individual property is the only way to guarantee the individual freedom to satisfy his needs.[12] "Nor was this appropriation of any parcel of land, by improving it, any prejudice to any other man, since there was still enough, and as good left."[13] This right is independent of the laws of any society. There is not a single way to read Locke's theory of property. Macpherson interpreted it as an intention to limit the accumulation of property in the state of nature. The property needs to be limited to the work made by man's hands. For Waldron, the "enough and as good" expression is a sufficient rather than a necessary condition.[14] For Locke the convention is created with the civil society and the laws to preserve and protect a pre-existing property.[15]

Mercier stresses that this approach is at the origin of occidental modern democracies and the liberalism theory. For Locke,[16] this is based on a natural law. "Men

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[11] John Locke, *Second Treatise of Civil Government*, (1690) The Constitution Society website, online <http://www.constitution.org/jl/2ndtr05.htm> (date accessed: March 13, 2012) [*Locke*]. See section 26: God, who hath given the world to men in common, hath also given them reason to make use of it to the best advantage of life, and convenience. The earth, and all that is therein, is given to men for the support and comfort of their being. And tho' all the fruits it naturally produces, and beasts it feeds, belong to mankind in common, as they are produced by the spontaneous hand of nature; and no body has originally a private dominion, exclusive of the rest of mankind, in any of them, as they are thus in their natural state: yet being given for the use of men, there must of necessity be a means to appropriate them some way or other, before they can be of any use, or at all beneficial to any particular man. The fruit, or venison, which nourishes the wild Indian, who knows no enclosure, and is still a tenant in common, must be his, and so his, i.e. a part of him, that another can no longer have any right to it, before it can do him any good for the support of his life.

[12] *Mercier, supra* note 9 at 322.

[13] *Locke*, *supra* note 11.

[14] *Locke*, *supra* note 11.
Though the earth, and all inferior creatures, be common to all men, yet every man has a property in his own person: this no body has any right to but himself. The labour of his body, and the work of his hands, we may say, are properly his. Whatsoever then he removes out of the state that nature hath provided, and left it in, he hath mixed his labour with, and joined to it something that is his own, and thereby makes it his property. It being by him removed from the common state nature hath placed it in, it hath by this labour something annexed to it, that excludes the common right of other men: for this labour being the unquestionable property of the labourer, no man but he can have a right to what that is once joined to, at least where there is enough, and as good, left in common for others.

[15] *Mercier, supra* note 9 at 160

[16] *Locke*, *supra* note 11.
[L'origine de la société politique : extrait du chapitre IX, Des fins de la société politique et du gouvernement] «Si l'homme, dans l'état de nature, est aussi libre que j'ai dit, s'il est le seigneur absolu de sa personne et de ses possessions, égal au plus grand et sujet à personne; pourquoi se dépouille-t-il de sa liberté et de cet empire, pourquoi se soumet-il à la domination et à l'inspection de quelque autre pouvoir? Il est aisé de répondre, qu'encore que, dans l'état de nature, l'homme ait un droit, tel que nous avons posé, la

living according to reason, without a common superior on earth, to judge between them, is properly the state of nature."[17] Locke explains that as all men live in the same natural order where equity and justice will not be respected, what they possess on the basis of this natural law is at risk. The role of government is to guarantee the property rights of individuals.[18] For Locke, laws will be fair as long as they are based on this law of nature.

Rousseau also refers to natural law. Men have moved from the state of nature to a political society, what he calls the social contract (le *pacte social*). They decide to renounce the law of nature and agree to submit to the laws of a State.[19] In his approach, unlimited property creates social inequalities, which, at the end, will contradict individual needs.[20] Positive law is in line with natural law to realize this social contract. As a consequence, Rousseau's theory does not permit unlimited private property since it will lead to a situation where some people get very rich while others live in misery.[21] In addition, both Rousseau and Locke consider that, on the basis of natural law, it is possible to have property belonging to everyone in common as long as it is limited to their subsistence needs.

Finally for Marx, property has created inequalities in society. Common property is the only way to provide the individual the freedom necessary to satisfy his needs.[22] Production forces will be subjected to common control and, as a consequence, the notion of private property will disappear to be replaced by common property.[23] As underlined by Mercier, the three philosophers – Locke, Rousseau and Marx – base individual freedom

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jouissance de ce droit est pourtant fort incertaine et exposée sans cesse à l'invasion d'autrui. Car, tous les hommes étant Rois, tous étant égaux et la plupart peu exacts observateurs de l'équité et de la justice, la jouissance d'un bien propre, dans cet état, est mal assurée, et ne peut guère être tranquille. C'est ce qui oblige les hommes de quitter cette condition, laquelle, quelque libre qu'elle soit, est pleine de crainte, et exposée à de continuels dangers, et cela fait voir que ce n'est pas sans raison qu'ils recherchent la société, et qu'ils souhaitent de se joindre avec d'autres qui sont déjà unis ou qui ont dessein de s'unir et de composer un corps, pour la conservation mutuelle de leurs vies, de leurs libertés et de leurs biens; choses que j'appelle, d'un nom général, propriétés.

[17] *Locke*, *supra* note 11 Chapter III - Of the State of War.
[18] *Mercier*, *supra* note 9 at 324.
[19] *Ibid* at 325.
[20] *Ibid* at 322.
[21] *Ibid* at 326.
[22] *Ibid* at 322.
[23] *Ibid* at 330.

on the freedom to use the fruits of one's work. Mercier concludes that the concepts of property are more moral than theoretical.[24]

The notion of common property is of particular interest for this study: the common objective is to satisfy individual need. Explorers in space missions will look for means to use natural resources they find *in situ* to satisfy their own needs. In fact, the main question is to what extent can a person own the natural resources he finds in space? The Moon Agreement makes a clear distinction between samples to be used for the purpose of a mission and the exploitation of such resources. It states that "States Parties shall have the right to collect on and remove from the Moon samples of its mineral and other substances."[25] For the Agreement, the freedom to collect and remove the samples is limited to scientific investigation - it is not an unlimited right. It is allowed to use what corresponds to what can satisfy his needs. For this reason, the philosophical approach seems to provide the right answer when space natural resources are used to satisfy the needs of a mission. It, however, does not answer to the question of exploitation.

2. THE NEGOTIATION OF THE LAW OF THE SEA – THE CASE OF THE DEEP SEA BED

The question of the global commons was extensively debated during the negotiation of the Law of the Sea Convention, notably regarding the legal regime that would be applicable to the resources of the seabed and deep seabed, and the common heritage of mankind principle. In support of the French internationalist Fauchille, Pancracio considers that today, the notion of *res communis* and *res nullius* are not relevant anymore as international cooperation should be the common objective in the high seas.[26] This argument comes from the idea of the high seas being open to all States and all men, without any sovereign or community appropriation.

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[24] *Ibid* at 333 where the author notes:
Cette "moralisation" s'opère lorsqu'ils établissent une adéquation, nécessaire car supposément naturelle, entre la propriété et la satisfaction des besoins individuels. Du coup, ils en viennent à soutenir que le seul véritable sujet de la propriété est l'individu, que l'authentique propriété est celle qui consacre la liberté de l'individu de satisfaire ses besoins.

[25] *Agreement Governing the Activities of states on the Moon and other Celestial Bodies*, 18 December 1979 1363 UNTS 3, 18 ILM 1434 art 6(2) [*Moon Agreement*].

[26] Jean-Paul Pancracio, *Droit de la mer*, 1st ed (Paris: Précis Dalloz, 2010) at 297 paragraph 395 [*Pancracio*] where the author refers to P Fauchille, *Droit international public*, vol 1 t 2 (Paris: PUF) at 14-15.

The idea of the Common Heritage of Mankind emerged in 1967 and, during the three decades that followed, the topic formed the subject of discussion regarding the adoption of specific mechanisms for the deep seabed. The negotiations that led to the adoption of a regime to govern resources exploitation in the deep sea bed illustrate the difficulties relating to the adoption of a regime on the global commons. At the beginning of the negotiation of the Law of the Sea, countries involved in the discussion were not ready to define a regime for this area.

Before the adoption of the Law of the Sea, pioneer investors had created various consortia to exploit the deep sea bed. They were authorized to conduct preliminary exploration and study activities and, once registered, they could claim an area while ensuring respect for the area claimed by another country. This led national authorities to grant authorizations without production limits and motivated several countries (United States, Germany and United Kingdom) not to ratify the Convention.[27]

As analysed in more detail in this chapter, after almost ten years of negotiation, the third United Nations Convention on the Law of the Sea (UNCLOS III) adopted in 1982 failed to attract the support of the industrialized countries. Its provisions dealing with the sea and ocean floor were considered not viable.[28] UNCLOS III was inspired by developing countries[29] and was heavily criticized by the developed countries. A revised version of the Convention dedicated to the Area was subsequently prepared and adopted in 1994 as the New York Agreement. It is important to mention that the deep sea bed mechanism was adopted at a time when exploitation of the resources had not really commenced.

Today, exploration and a better understanding of the resources of the deep sea bed continue to be the priority. It is important to note also that, as of 2009, about only 8% of the resources of the oceans had been mapped.[30] It is envisaged that in depth exploitation of the oceans will only commence when there is a shortfall in mineral resources from other Earth-based sources. It is likely that exploitation will start from the continental shelf

[27] Philippe Vincent, *Droit de la mer*, (Paris: Editions Larcier, 2008) at 144-45 [*Vincent*].
[28] Droits maritimes, sous la direction de Jean-Pierre Beurier, Dalloz Action 2009-2010, édition 2009, paragraph 117.07. [*Beurier*].
[29] *Pancracio*, *supra* note 26 at 338 paragraph 454.
[30] *Pancracio*, *supra* note 26 at 340 28 paragraph 457.

since obtaining access to that area should be easier although the drilling technology is presently quite costly.[31] As developed below, despite the 1994 New York Agreement, the current regime is far from being entirely satisfactory.

III. FUNDAMENTAL LEGAL PRINCIPLES OF THE ANTARCTIC AND THE SEA MODELS

1. FUNDAMENTAL PRINCIPLES OF THE LAW OF ANTARCTICA

This section provides a historical overview of the elaboration of the international law applicable to Antarctica. It then reviews the fundamental legal principles of the 1959 Antarctic Treaty and the 1991 Protocol.

1.1 HISTORY

After the end of the Second World War, there were increasing concerns about the interests of different countries in relation to the Antarctic. At that time, the issue did not concern the natural resources but rather a potential use of the area for military activities. The concern was that the difficult international relations brought about by the Cold War would be extended to the Antarctic.[32] At the same time, a few States were strongly motivated to conduct scientific experiments in Antarctica. The celebration of the International Geophysical Year in 1957-1958 was an important milestone for research in Antarctica. Twelve countries – Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, the United Kingdom and the United States – met in Washington DC in 1958 to prepare an international convention on Antarctica. A few months later, the treaty was signed on December 1st, 1959 and it subsequently entered into force on 23 June 1961.[33] It is traditionally referred to as the Antarctic Treaty System since the 1959 Antarctic Treaty has been complemented with additional legal instruments, notably: the 1972 Convention for conservation of Antarctic Seals;[34] the 1980 Convention on the conservation of Antarctic Marine Living Resources[35] and the 1991 Protocol on Environmental Protection of the Antarctic.[36]

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[31] *Ibid* at 340 paragraph 457.
[32] See H Gerald Staub, "The Antarctic Treaty as precedent to the Outer Space Treaty", *Proceedings of the 17th Colloquium on the Law of Outer Space*, (Herndon, VA: IISL/AIAA, 1974) [Staub].
[33] *The Antarctic Treaty*, 1 December 1959, 12 UST 794, 402 UNTS 71, 19 ILM 860 [*1959 Antarctic Treaty*].
[34] *Convention for the Conservation of Antarctic Seals*, 1 June 1972, 1080 UNTS 175, 1 ILM 251 [*Antarctic Seals Convention*].

The 1959 Antarctic Treaty was negotiated at the same time as COPUOS was being established and at its adoption in 1959, it was signed by 12 States.[37] As at end of 2010, there were 48 Signatories.[38] As stressed by the British Antarctic Survey, "the Antarctic Treaty contains just 14 articles, yet effectively manages 10% of the Earth's surface."[39] The objective of the treaty was initially to ensure good international cooperation in scientific investigations of the Antarctic. In 1961, the Antarctic Treaty Consultative Meeting (ATCM) was established, and regular meetings were held in the subsequent years to exchange information and make decisions regarding the activities and the protection of this area. As a result of the efficient international interactions that took place within the framework of the Consultative Meetings, further recommendations, resolutions and other legal texts were developed and adopted to regulate the conduct of activities in Antarctica. Based on article IX of the Antarctic Treaty, delegates to the Consultative Meetings meet:

> for the purpose of exchanging information, consulting together on matters of common interest pertaining to Antarctica, and formulating and considering, and recommending to their Governments, measures in furtherance of the principles and objectives of the Treaty, including measures regarding: a. use of Antarctica for peaceful purposes only; b. facilitation of scientific research in Antarctica; c. facilitation of international scientific cooperation in Antarctica; d. facilitation of the exercise of the rights of inspection provided for in Article VII of the Treaty; e. questions relating to the exercise of jurisdiction in Antarctica and f. preservation and conservation of living resources in Antarctica.[40]

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[35] *Convention on the Conservation of Antarctic Marine Living Resources*, 20 May 1980, 1329 UNTS 47 [*CCAMLR*].
[36] *Protocol on Environmental Protection to the Antarctic Treaty*, 4 October 1991, 30 ILM 1455 [*1991 Protocol on Environmental Protection*].
[37] These States were: Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, the USA and the UK
[38] For the list of current signatories, see the Scientific Community on Antarctic Research website, online <http://www.scar.org/treaty/signatories.html> (date accessed: March 13, 2012). They are: United Kingdom, South Africa, Belgium, Japan, United States of America, Norway, France, New Zealand, Russia, Poland, Argentina, Australia, Chile, Czech Republic, Slovak Republic, Denmark, The Netherlands, Romania, German Democratic Republic, Bulgaria, Federal Republic of Germany, Uruguay, Papua New Guinea, Peru, Spain, People's Republic of China, India, Hungary, Sweden, Finland, Cuba, Republic of Korea, Greece, Democratic People's Republic of Korea, Austria, Ecuador, Canada, Colombia, Switzerland, Guatemala, Ukraine, Turkey, Venezuela, Estonia, Belarus, Monaco, Portugal.
[39] The British Antarctic Survey is an environmental research centre responsible for the UK's national scientific activities in Antarctic. See the British Antarctic Survey website, online: <http://www.Antarctic.ac.uk/about_bas/index.php> (date accessed: March 13, 2012).
[40] *1959 Antarctic Treaty*, *supra* note 33 Art IX.

Still today, this forum is a useful means for encouraging interaction and international cooperation and for making decisions on the basis of consensus, like COPUOS for outer space. Consultative Meetings are held on an annual basis instead of once every two years and this demonstrates the continuing need for such a body.[41]

In addition to the Consultative Meetings, there is a Scientific Committee on Antarctic Research (SCAR) which coordinates Antarctic research programs and encourages scientific cooperation among States Parties to the Treaty.[42] There is also a Council of Managers of National Antarctic Programs – a forum where the heads of the various national agencies in charge of Antarctic programs of the States Parties meet to exchange logistic information and deal with practical matters.[43]

1.2 FUNDAMENTAL LEGAL PRINCIPLES OF THE ANTARCTIC TREATY SYSTEM

The Antarctic Treaty System comprises the 1959 Antarctic Treaty and related agreements. As noted above, this chapter focuses mainly on the key provisions of the Antarctic Treaty[44] and the 1991 Protocol.[45]

1.2.1 THE ANTARCTIC TREATY

The principle of peaceful use governs Antarctica. Accordingly, there is a prohibition of military activities in Antarctica. Article I of the Antarctic Treaty provides that the "Antarctic shall be used for peaceful purposes only. There shall be prohibited, inter alia, any measure of a military nature, such as the establishment of military bases and fortifications, the carrying out of military manoeuvres, as well as the testing of any type of weapon."[46] Antarctica provides a good test bed for the conduct of scientific experiments. For this purpose, the principle of freedom of scientific investigation applies

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[41] See the Secretariat of the Antarctic Treaty website online: <http://www.ats.aq/e/ats_meetings_atcm.htm> (date accessed: March 13, 2012).
[42] See Scientific Community on Antarctic Research website, online: <http://www.scar.org/> (date accessed: March 13, 2012). The SCAR forms part of the International Council for Science (ICSU). SCAR is charged with initiating, developing and coordinating high quality international scientific research in the Antarctic region, and on the role of the Antarctic region in the Earth system. It also provides objective and independent scientific advice to the Antarctic Treaty Consultative Meetings and other organizations on issues of science and conservation affecting the management of Antarctic and the Southern Ocean.
[43] See Council of Managers of National Antarctic Program (COMNAP) website, online: <https://www.comnap.aq/> (date accessed: March 13, 2012).
[44] *1959 Antarctic Treaty*, *supra* note 33.
[45] *1991 Protocol on Environmental Protection*, *supra* note 36.
[46] However, the treaty does not prevent the use of military personnel or equipment for scientific research or for any other peaceful purpose. See *1959 Antarctic Treaty*, *supra* note 33 art I(2).

to Antarctica.[47] This principle is closely linked to international scientific cooperation considering the role of international teams in the exploration of Antarctica. Article III of the Treaty therefore provides as follows:

> In order to promote international cooperation in scientific investigation in Antarctic […] the Contracting Parties agree that, to the greatest extent feasible and practicable: a. information regarding plans for scientific programs in Antarctic shall be exchanged to permit maximum economy of and efficiency of operations; b. scientific personnel shall be exchanged in Antarctic between expeditions and stations; c. scientific observations and results from Antarctic shall be exchanged and made freely available.[48]

Article IV of the 1959 Antarctic Treaty on territorial sovereignty requires particular attention since it neither recognizes nor denies claims of sovereignty over portions of Antarctica. The United Kingdom, France, Norway, New Zealand and Australia have made such claims in the past. Argentina and Chile made claims which overlapped those of the United Kingdom. It is interesting to note that at this stage, while the United States and Russia have not recognized the claims made by other countries, they have not made any claims themselves. This does not preclude the possibility that they could do so in the future.[49]

Article IV of the Antarctic Treaty clearly states that ratification of the Treaty does not mean "a renunciation by any Contracting Party of previously asserted rights of or claims to territorial sovereignty in Antarctic […]." This article shows that legal issues, rights and claims related to sovereignty over the Antarctic remain present today. The first part of article IV succeeds in conciliating the numerous countries involved in the Treaty: those that have made claims; those that are disputing claims made by others; and, those who may do so in the future.[50] The second part of article IV freezes the claims. The difficulty is to determine the legal status of those claims which have survived as a result of the operation of article IV.

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[47] *Ibid* art II.
[48] *Ibid* art III.
[49] Armel Kerrest, "Law and Policy of International Spaces: Antarctic, High-Sea and Outer Space", Presentation delivered at the 2nd ASI/ESA Workshop on International Cooperation for Sustainable Space Exploration, Spineto, 2006 [Kerrest, Law and Policy of International Spaces].
[50] See Donald R Rothwell. "The Law of the Sea and the Antarctic Treaty System: Rougher Seas Ahead for the Southern Ocean?" in J Jabour-Green & M Haward, eds, *The Antarctic: Past, Present and Future* (Hobart, Australia: Antarctic CRC Research Report No. 28. 2002) at 113-125 reproduced on University of Tasmania website, online: <http://eprints.utas.edu.au/2661/19/17_Rothwell.pdf> (date accessed: March 13, 2012) [*Rothwell*].

In order to protect the area, the Treaty forbids "[a]ny nuclear explosions in Antarctic and the disposal there of radioactive waste material."[51] For purposes of ensuring that the provisions of the Antarctic Treaty are properly complied with, the Treaty makes provision for the conduct of inspections. Each State Party to the Treaty has a right to designate observers to carry out any inspection and each observer shall have complete freedom of access at any time to all areas and stations; installations and equipment shall be open at all times to inspection. Finally, the parties have agreed to a notification process.[52]

With respect to the jurisdiction principle, the Antarctic Treaty applies the principle of nationality.[53] Observers and scientific personnel exchanged and staff members accompanying any such personnel shall be subject only to the jurisdiction of the Contracting Party of which they are nationals in respect of all acts or omissions occurring while they are in Antarctic for the purpose of exercising their functions. Article XI provides a mechanism for the settlement of disputes that may arise between States Parties.[54] Consultation is encouraged for purposes of resolving disputes through negotiation, inquiry, mediation, conciliation, arbitration, judicial settlement or other peaceful means of their own choice. If a dispute cannot be resolved by any of these means, it may be referred to the International Court of Justice for settlement with the consent of all parties to the dispute.

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[51] *1959 Antarctic Treaty*, *supra* note 33 art V.

[52] *Ibid* art VII(1):
In order to promote the objectives and ensure the observance of the provisions of the present Treaty, each Contracting Party whose representatives are entitled to participate in the meetings referred to in Article IX of the Treaty shall have the right to designate observers to carry out any inspection provided for by the present Article. Observers shall be nationals of the Contracting Parties which designate them. The names of observers shall be communicated to every other Contracting Party having the right to designate observers, and like notice shall be given of the termination of their appointment.

[53] *Ibid* art VIII(1):
In order to facilitate the exercise of their functions under the present Treaty, and without prejudice to the respective positions of the Contracting Parties relating to jurisdiction over all other persons in Antarctic, observers designated under paragraph 1 of Article VII and scientific personnel exchanged under sub-paragraph 1(b) of Article III of the Treaty, and members of the staffs accompanying any such persons, shall be subject only to the jurisdiction of the Contracting Party of which they are nationals in respect of all acts or omissions occurring while they are in Antarctic for the purpose of exercising their functions.

[54] *Ibid* art XI(1):
If any dispute arises between two or more of the Contracting Parties concerning the interpretation or application of the present Treaty, those Contracting Parties shall consult among themselves with a view to having the dispute resolved by negotiation, inquiry, mediation, conciliation, arbitration, judicial settlement or other peaceful means of their own choice.

Article V recalls the need to respect international law: "Each of the Contracting Parties undertakes to exert appropriate efforts, consistent with the Charter of the United Nations, to the end that no one engages in any activity in Antarctic contrary to the principles or purposes of the present Treaty." Finally, provisions concerning modification and duration are of critical importance to the Antarctic Treaty.[55] The first part of article XII contains rules for modification or amendment of the Treaty. The second part provides that:

> if after the expiration of thirty years from the date of entry into force of the present Treaty, any of the Contracting Parties whose representatives are entitled to participate in the meetings provided for under Article IX so requests by a communication addressed to the depositary Government, a Conference of all the Contracting Parties shall be held as soon as practicable to review the operation of the Treaty.

Any modification or amendment of the Treaty approved at such conference requires the support of a majority of the Contracting Parties. None of the States Parties called for such a conference during the first 30 years following the entry into force of the Treaty. Instead, in 1991, the parties signed a declaration thereby adopting the Madrid Protocol on Environmental Protection to the Antarctic Treaty "to strengthen the Antarctic

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[55] *Ibid* art XII:
1(a) The present Treaty may be modified or amended at any time by unanimous agreement of the Contracting Parties whose representatives are entitled to participate in the meetings provided for under Article IX. Any such modification or amendment shall enter into force when the depositary Government has received notice from all such Contracting Parties that they have ratified it.
1(b) Such modification or amendment shall thereafter enter into force as to any other Contracting Party when notice of ratification by it has been received by the depositary Government. Any such Contracting Party from which no notice of ratification is received within a period of two years from the date of entry into force of the modification or amendment in accordance with the provision of subparagraph 1(a) of this Article shall be deemed to have withdrawn from the present Treaty on the date of the expiration of such period.
2(a) If after the expiration of thirty years from the date of entry into force of the present Treaty, any of the Contracting Parties whose representatives are entitled to participate in the meetings provided for under Article IX so requests by a communication addressed to the depositary Government, a Conference of all the Contracting Parties shall be held as soon as practicable to review the operation of the Treaty.
2(b) Any modification or amendment to the present Treaty which is approved at such a Conference by a majority of the Contracting Parties there represented, including a majority of those whose representatives are entitled to participate in the meetings provided for under Article IX, shall be communicated by the depositary Government to all Contracting Parties immediately after the termination of the Conference and shall enter into force in accordance with the provisions of paragraph 1 of the present Article.
2(c) If any such modification or amendment has not entered into force in accordance with the provisions of subparagraph 1(a) of this Article within a period of two years after the date of its communication to all the Contracting Parties,any Contracting Party may at any time after the expiration of that period give notice to the depositary Government of its withdrawal from the present Treaty; and such withdrawal shall take effect two years after the receipt of the notice by the depositary Government.

Treaty system so as to ensure that Antarctic shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord."[56]

1.2.2 THE 1991 PROTOCOL ON ENVIRONMENTAL PROTECTION

This Protocol is a short text with simple principles. It supplements the Antarctic Treaty without modifying or amending it.[57] Article 2 on Objective and Designation states that: "the Parties commit themselves to the comprehensive protection of the Antarctic environment and dependent and associated ecosystems and hereby designate Antarctic as a natural reserve, devoted to peace and science". Article 3 includes important and detailed environment principles. Article 6 also provides detailed mechanisms[58] related to cooperation in the planning and conduct of activities, sharing of information as well as cooperation with "those Parties which may exercise jurisdiction in areas adjacent to the Antarctic Treaty."

Article 8 of the Protocol allows activities such as "scientific research programs, tourism and all other governmental and non-governmental activities." No dedicated mention of the natural resources is made. Prior to undertaking such activities, States Parties need to conduct assessments of the impact they will have on the Antarctic environment. The procedure for those assessments is detailed in Annex I to the Protocol

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[56] *1991 Protocol on Environmental Protection*, *supra* note 36.
[57] *Ibid* art 4.
[58] *Ibid* art 6 Cooperation:
1. The Parties shall cooperate in the planning and conduct of activities in the Antarctic Treaty area. To this end, each Party shall endeavour to:
(a) promote cooperative programs of scientific, technical and educational value, concerning the protection of the Antarctic environment and dependent and associated ecosystems;
(b) provide appropriate assistance to other Parties in the preparation of environmental impact assessments;
(c) provide to other Parties upon request information relevant to any potential environmental risk and assistance to minimise the effects of accidents which may damage the Antarctic environment or dependent and associated ecosystems;
(d) consult with other Parties with regard to the choice of sites for prospective stations and other facilities so as to avoid the cumulative impacts caused by their excessive concentration in any location;
(e) where appropriate, undertake joint expeditions and share the use of stations and other facilities; and
(f) carry out such steps as may be agreed upon at Antarctic Treaty Consultative Meetings.
2. Each Party undertakes, to the extent possible, to share information that may be helpful to other Parties in planning and conducting their activities in the Antarctic Treaty area, with a view to the protection of the Antarctic environment and dependent and associated ecosystems.
3. The Parties shall co-operate with those Parties which may exercise jurisdiction in areas adjacent to the Antarctic Treaty area with a view to ensuring that activities in the Antarctic Treaty area do not have adverse environmental impacts on those areas.

and they include the initial environmental evaluation, the comprehensive environmental evaluation and the possible decisions.

The Protocol details the rules applicable to international bodies. Among these, Antarctic Treaty Consultative Meetings are mandated to define the general policy for the comprehensive protection of the Antarctic environment and to adopt measures for the implementation of the Protocol.[59] Article 11 of the Protocol also establishes a Committee for Environmental Protection.[60] Protocol provisions governing the conduct of inspections by observers complement those of the Antarctic Treaty; the text also contains emergency response action provided for as an initial response to environmental emergencies.[61] Based on the obligation to elaborate rules and procedures relating to liability for damage arising from activities covered by the Protocol as set out in article 16, Annex VI contains detailed provisions on liability arising from environmental emergencies. As for dispute settlement, the Protocol provides a detailed framework. Parties may choose one or both means: either the International Court of Justice or the Arbitral Tribunal.

The Protocol is followed by several annexes. Among them, Annex V on Area protection and management contains interesting provisions. The Protocol provides for the creation of *Antarctic Specially Protected Areas*, defined as "any area, including any marine area, to protect outstanding environmental, scientific, historic, aesthetic or wilderness values, any combination of those values, or ongoing or planned scientific

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[59] *Ibid* art 10.

[60] *Ibid* art 11: Committee for Environmental Protection:
1. There is hereby established the Committee for Environmental Protection.
2. Each Party shall be entitled to be a member of the Committee and to appoint a representative who may be accompanied by experts and advisers.
3. Observer status in the Committee shall be open to any Contracting Party to the Antarctic Treaty which is not a Party to this Protocol.
4. The Committee shall invite the President of the Scientific Committee on Antarctic Research and the Chairman of the Scientific Committee for the Conservation of Antarctic Marine Living Resources to participate as observers at its sessions. The Committee may also, with the approval of the Antarctic Treaty Consultative Meeting, invite such other relevant scientific, environmental and technical organisations which can contribute to its work to participate as observers at its sessions.
5. The Committee shall present a report on each of its sessions to the Antarctic Treaty Consultative Meeting. The report shall cover all matters considered at the session and shall reflect the views expressed. The report shall be circulated to the Parties and to observers attending the session, and shall thereupon be made publicly available.
6. The Committee shall adopt its rules of procedure which shall be subject to approval by the Antarctic Treaty Consultative Meeting.

[61] *Ibid* art 15 on emergency response action.

research."[62] *Antarctic Specially Managed Areas* are "any area, including any marine area, where activities are being conducted or may in the future be conducted, to assist in the planning and co-ordination of activities, avoid possible conflicts, improve co-operation between Parties or minimize environmental impacts." The Protocol was open for signature at Madrid on 4 October 1991. It entered into force in 1998. Article 25 provides: "If, after the expiration of 50 years from the date of entry into force of this Protocol, any of the Antarctic Treaty Consultative Parties so requests by a communication addressed to the Depositary, a conference shall be held as soon as practicable to review the operation of this Protocol." It will be interesting to see the existing parallelism between the law of Antarctic and the law of the Sea. Analogies on the fundamental provisions are closely linked to space natural resources issues.

2. FUNDAMENTAL PRINCIPLES OF THE LAW OF THE SEA

2.1 HISTORY

Historically, the Law of the Sea developed from customary international law starting with the principle of freedom of navigation of the seas. Codification in this branch of international law only commenced in 1958 and this was mainly driven by the fact that commercial activities related to the Sea were growing.

The first UN Conference on the Law of the Sea was held in Geneva in 1958. It culminated in the adoption of four Conventions and a Protocol: The Convention on the Territorial Sea and the Contiguous Zone (CTS), which dealt with the territorial sea and the contiguous zone and addressed the difficult question of the right of innocent passage; the Convention on the High Seas (CHS), which focused on the high seas and the rights and duties of States related thereto; the Convention on Fishing and Conservation of the Living Resources of the High Seas (CFCLR), which dealt with management of fisheries in the high seas; the Convention on the Continental Shelf (CCS), which dealt with the continental shelf; and the Optional Protocol of Signature concerning the Compulsory Settlement of Disputes (OPSD), which established the compulsory jurisdiction of the

[62] *Ibid* art 3.

International Court of Justice over any disputes arising under the four conventions.[63] The Protocol was never applied. Considering the lack of agreement on several important issues, notably the limits of the contiguous zone and the fishing limits, a new convention was prepared a few years later.

The second UN Conference on the law of the sea (UNCLOS II) took place from March 17 to April 26, 1960. The main objective of the conference was to achieve consensus on the delimitation of the territorial sea – an issue that had a direct impact on fishing rights. Ultimately, UNCLOS II did not achieve the desired consensus since there were irreconcilable differences between States' perceptions of the extent of their sovereign fishing rights.[64] The issue is linked to a conflict over the resources - States were trying to extend their fishing zones. In the years that followed, many States made unilateral claims over broad exclusive fishing zones in the sea.[65]

Ten years later, the United Nations General Assembly decided to hold a third conference on the law of the sea. In its Resolution 2749(XXV) of 17 December 1970, the UN General Assembly stated that: "the seabed and ocean floor and the subsoil thereof, beyond the limits of national jurisdiction, as well as the resources, are the common heritage of mankind, the exploration and exploitation of which shall be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States."[66] The Resolution also mentioned that matters not regulated by the 1958 Geneva Convention continue to be governed by the rules and principles of general international law.

Although the Geneva Conventions had been in force for number of years, the UN General Assembly continued to work on the elaboration of a single, all-encompassing instrument on the law of the sea. As explained by Treves,[67] the work was organized in such a way that issues were grouped together and decisions taken "by package" on the

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[63] These four conventions are cumulatively known as the Geneva Conventions on the Law of the Sea. For a general background and overview of these conventions, See Tullio Treves, "The 1958 Geneva Conventions on the Law of the Sea", UN website, online <http://untreaty.un.org/cod/avl/ha/gclos/gclos.html> [Treves].
[64] See UNEP Continental Shelf Programme website, online: <http://continentalshelf.org/about/1143.aspx> (date accessed: March 13, 2012).
[65] Sun Pyo Kim, *Maritime delimitation and interim arrangements in North East Asia*, (Leiden: Martinus Nijhoff /Brill, 2004) at 7 [*Kim*].
[66] *Declaration of Principles Governing the Seabed and the Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction*, GA Res 2749(XXV), UNGAOR, 25th Sess, Supp No 28 (1970) [*GA Res 2749(XXV)*].
[67] Treves, *supra* note 63.

basis of consensus. The United Nations Convention of the Law of the Sea[68] was adopted on December 10, 1982 in Montego Bay, Jamaica, and it subsequently entered into force on 14 November 1994. It represents a major achievement in the codification of international law. The convention contains 320 articles and 9 annexes. As a consequence, the 155 States bound by the Geneva Convention are also bound by the 1982 Convention.[69]

The convention was influenced by the desire of developing countries to see a better balance in trade and development financing.[70] Several newly created States did not wish to become party to the 1958 Conventions. "For most of these new States the priorities in the uses of the seas were different than those of the maritime powers that had dominated the scene in Geneva."[71] The exploitation of the natural resources of the sea became a critical topic, whereas, in the past, the debate was almost exclusively focused on the rights of navigation. The 1982 Law of the Sea Convention (UNCLOS) was considered as a consensus text[72] despite the fact that some of its provisions remained controversial. One of the key contentious issues (of immense relevance to our present purposes) relates to the position adopted by the US and several other countries on the provisions concerning the status of the resources of the deep seabed. There was a trend of growing commercial interest in these resources in the developed countries whereas developing countries wished that those resources be categorized as forming part of the common heritage of mankind.[73]

This difference in opinion explains the slow ratification process. While the Convention was signed in 1982, it only entered into force in 1994. The regime governing the international seabed was negotiated in the meantime, between 1990 and 1994. In UN General Assembly Resolution 263 of 28 July 1994, agreement was finally reached on the

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[68] *United Nations Convention on the Law of the Sea*, 10 December 1982, 1833 UNTS 396 [*UNCLOS*].
[69] Treves, *supra* note 63.
[70] See United Nations Law of the Sea Treaty Information Center website, online: <http://www.unlawoftheseatreaty.org/>.
[71] Treves, *supra* note 63.
[72] *Ibid*.
[73] *Vincent*, *supra* note 27 at 31.

implementation of Part XI of the 1982 UNCLOS.[74] However, analysis will be made on the relative success of this international codification implementation.

2.2 FUNDAMENTAL PRINCIPLES OF THE LAW OF THE SEA

This subsection focuses on the two fundamental instruments: the 1982 UNCLOS and the 1994 Implementing Agreement. The purpose of the discussion is not to analyze the principles of the 1982 convention in its entirety, but rather to focus on those principles which are of specific interest for our present purposes.

2.2.1 THE 1982 UNITED NATIONS CONVENTION ON THE LAW OF THE SEA (UNCLOS)

The preamble to the treaty explicitly states that the purpose of the convention is "to codify the rules of international law relating to the high sea." The convention is considered to be an "important contribution to the maintenance of peace, justice and progress for all peoples of the world." The text of the preamble reflects the fact that the resources of the sea were identified as a key issue - an "equitable and efficient utilization of the resources" is mentioned.

The convention delimits the ocean into different parts or zones and prescribes a specific legal regime for each of them.[75] Part XVI of UNCLOS - General provisions - contains several important provisions. Article 300 establishes an obligation upon States Parties to fulfil the obligations assumed under the Convention in good faith, and to exercise the rights, jurisdiction and freedoms granted by the convention in a manner that would not constitute a breach of international law. Article 301 establishes the principle of peaceful uses of the seas.[76] Article 302 provides for the non disclosure of information that may be prejudicial to the essential security interests of a State Party.[77]

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[74] There are other important maritime agreements from the same period that are not discussed in this dissertation. These include: the 1995 Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks[74] as well as environment protection measures. It is notably the case of the 1972 United Nations Stockholm Conference on the Human Environment, and specific conventions (the London Dumping Convention of 1972 and the MARPOL convention of 1973) which were important milestones having an impact on the adoption of the law of the sea convention.

[75] See *UNCLOS*, *supra* note 68. Parts II to XI deal with all the activities in the different areas: territorial sea and contiguous zone (Part II), straits used for international navigation (Part III), archipelagic States (Part IV), exclusive economic zone (Part V), continental shelf (Part VI), high seas (Part VII), regime of islands (Part VIII), enclosed or semi-enclosed seas (Part IX), right of access of land-locked States to and from the sea and freedom of transit (Part X) and the area (Part XI).

[76] *Ibid* art 301: Peaceful uses of the seas: "In exercising their rights and performing their duties under this Convention, States Parties shall refrain from any threat or use of force against the territorial integrity or

Part II of UNCLOS describes the legal status of the territorial sea and contiguous zone. Article 2 establishes the legal status of the territorial sea, of the air space over the territorial sea and of its bed and subsoil.[78] Exclusive State sovereignty over this portion of the sea is clearly defined. The Convention establishes a 12-nautical mile territorial sea limit. In the exclusive economic zone (EEZ), the coastal State has sovereign rights for the purpose of exploring, exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the seabed and of the seabed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds.[79]

The Convention establishes a 200-mile exclusive economic zone limit and provides detailed rules relating to the jurisdiction of the coastal State over the EEZ. This includes provisions on innocent passage in the territorial sea[80] defined as passage which is "not prejudicial to the peace, good order or security of the coastal State."[81] The continental shelf of a coastal State comprises the seabed and subsoil of the submarine areas that extend beyond its territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin, or to a distance of 200-nautical miles from the baselines from which the breadth of the territorial sea is measured where the outer edge of the continental margin does not extend up to that distance.[82] The Coastal State has sovereign rights of exploration and exploitation of the natural resources of the continental shelf.[83] The Convention also describes the legal regimes that apply to the portions of the sea such as straits, internal waters and archipelagic waters.

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political independence of any State, or in any other manner inconsistent with the principles of international law embodied in the Charter of the United Nations".

[77] *Ibid* art 302: Disclosure of information: "Without prejudice to the right of a State Party to resort to the procedures for the settlement of disputes provided for in this Convention, nothing in this Convention shall be deemed to require a State Party, in the fulfilment of its obligations under this Convention, to supply information the disclosure of which is contrary to the essential interests of its security".

[78] *Ibid* art 2.

[79] *Ibid* art 55(1)(A).

[80] *Ibid* art 17: Right of innocent passage: "Subject to this Convention, ships of all States, whether coastal or land-locked, enjoy the right of innocent passage through the territorial sea".

[81] *Ibid* art 19: "Passage is innocent so long as it is not prejudicial to the peace, good order or security of the coastal State. Such passage shall take place in conformity with this Convention and with other rules of international law […]".

[82] *Ibid* art 74(A).

[83] *Ibid* art 77: "The coastal State exercises over the continental shelf sovereign rights for the purpose of exploring it and exploiting its natural resources […]."

Part VII applies to High Seas "all parts of the sea that are not included in the exclusive economic zone, in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State."[84] The principles of peaceful purposes[85] as well as freedom and right of navigation[86] apply to the high seas. Claims of sovereignty over the high seas are therefore considered invalid.[87]

Part VII Section 2 of UNCLOS deals with the conservation and management of the living resources of the high seas. Part XII deals with the protection and preservation of the marine environment. States are under an obligation to protect and preserve the marine environment.[88] Part XII also declares the fundamental sovereign right of States to exploit their natural resources.[89] The only limitation imposed on the exercise of this right is that States are required to take measures to prevent, reduce and control pollution of the marine environment; to avoid the transfer of damage or hazards or the transformation of one type of pollution into another.[90]

These provisions demonstrate that while exploitation is allowed, it is circumscribed by many measures.

Part XIII on maritime scientific research gives all States the right to conduct marine scientific research[91] and establishes a number of principles that must be respected by States during the conduct of marine scientific research.[92] This part also includes

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[84] *Ibid* Part VII art 86.
[85] *Ibid* art 88: "The high seas shall be reserved for peaceful purposes."
[86] *Ibid* arts 86, 87 and 90.
[87] *Ibid* art 89: "No State may validly purport to subject any part of the high seas to its sovereignty."
[88] *Ibid* art 192.
[89] *Ibid* art 193: Sovereign right of States to exploit their natural resources: "States have the sovereign right to exploit their natural resources pursuant to their environmental policies and in accordance with their duty to protect and preserve the marine environment."
[90] *Ibid* art 195: Duty not to transfer damage or hazards or transform one type of pollution into another: "In taking measures to prevent, reduce and control pollution of the marine environment, States shall act so as not to transfer, directly or indirectly, damage or hazards from one area to another or transform one type of pollution into another."
[91] *Ibid* art 238: Right to conduct marine scientific research: "All States, irrespective of their geographical location, and competent international organizations have the right to conduct marine scientific research subject to the rights and duties of other States as provided for in this Convention."
[92] *Ibid* art 240: General principles for the conduct of marine scientific research:
In the conduct of marine scientific research the following principles shall apply:
(a) marine scientific research shall be conducted exclusively for peaceful purposes;
(b) marine scientific research shall be conducted with appropriate scientific methods and means compatible with this Convention;

dedicated provisions on responsibility and liability including provisions governing responsibility and liability arising from marine scientific research undertaken on behalf of States.[93]

Finally, Part XV provides an exhaustive set of rules on the settlement of disputes. States Parties have an obligation to settle their disputes by any peaceful means[94] chosen by the Parties.[95] States Parties to the Convention have absolute discretion in the choice of the procedure.[96] As such, there is a wide spectrum of potential ways to find suitable solutions to disputes.

Part XI, of particular importance for the study, describes in details the provisions applicable to the Area, the zone beyond the limits of national jurisdiction and subject of important economic interests, generating disagreements between developing and developed countries from the beginning.

Considering the difficulty associated with the provisions of Part XI of UNCLOS, the United Nations General Assembly, at the insistence of the United States, convened a

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(c) marine scientific research shall not unjustifiably interfere with other legitimate uses of the sea compatible with this Convention and shall be duly respected in the course of such uses;
(d) marine scientific research shall be conducted in compliance with all relevant regulations adopted in conformity with this Convention including those for the protection and preservation of the marine environment.

[93] *Ibid* art 263: Responsibility and liability:
1. States and competent international organizations shall be responsible for ensuring that marine scientific research, whether undertaken by them or on their behalf, is conducted in accordance with this Convention.
2. States and competent international organizations shall be responsible and liable for the measures they take in contravention of this Convention in respect of marine scientific research conducted by other States, their natural or juridical persons or by competent international organizations, and shall provide compensation for damage resulting from such measures […].

[94] *Ibid* art 279: Obligation to settle disputes by peaceful means: "States Parties shall settle any dispute between them concerning the interpretation or application of this Convention by peaceful means in accordance with Article 2, paragraph 3, of the Charter of the United Nations and, to this end, shall seek a solution by the means indicated in Article 33, paragraph 1, of the Charter."

[95] *Ibid* art 280: Settlement of disputes by any peaceful means chosen by the parties: "Nothing in this Part impairs the right of any States Parties to agree at any time to settle a dispute between them concerning the interpretation or application of this Convention by any peaceful means of their own choice."

[96] *Ibid* art 287: Choice of procedure:
1. When signing, ratifying or acceding to this Convention or at any time thereafter, a State shall be free to choose, by means of a written declaration, one or more of the following means for the settlement of disputes concerning the interpretation or application of this Convention:
(a) the International Tribunal for the Law of the Sea established in accordance with Annex VI;
(b) the International Court of Justice;
(c) an arbitral tribunal constituted in accordance with Annex VII;
(d) a special arbitral tribunal constituted in accordance with Annex VIII for one or more of the categories of disputes specified therein.

conference to negotiate and agree upon an implementing agreement. One of the most controversial issues was the definition of the rules concerning "the area" - the seabed and ocean floor and subsoil thereof beyond the limits of national jurisdiction. The conference culminated in the adoption of the Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (Implementing Agreement). The Implementing Agreement was adopted on 28 July 1994: it supplements Part XI of UNCLOS. [97]

The preamble of the Implementing Agreement recalls that the resources of the area are the common heritage of mankind. It underlines the consultations that took place from 1990 to 1994 on outstanding issues relating to Part XI of UNCLOS and the political and economic changes, including market-oriented approaches, affecting the implementation of Part XI. The objective of the agreement is to encourage wide participation in the Convention. Under article 1, the States Parties to the Implementing Agreement undertake to implement Part XI of UNCLOS in accordance with the Agreement. Both the Agreement and the Convention are to be interpreted and applied together as a single instrument.[98] Having looked at the main features of both regimes, the next section of this chapter provides a comparative analysis of the fundamental provisions of the Law of the Sea, the Antarctic Treaty System and the law of outer space.

3. SIMILARITIES AND DIFFERENCES BETWEEN THE LAW OF THE ANTARCTIC, THE LAW OF THE SEA AND THE OUTER SPACE TREATY

3.1 SIMILARITIES

Historically, legal questions concerning Antarctica and Outer space were raised almost at the same time. "These areas have a common denominator and [are] therefore usually designated by a single term - Global Commons."[99] On September 22, 1960, President Eisenhower proposed at the UN General Assembly that the principles of the Antarctic Treaty be applied to outer space and celestial bodies. The objective was to

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[97] *Agreement relating to the Implementation of Part XI of the UN Convention on the Law of the Sea of 10 December, 1982*, 28 July 1994, 33 ILM 1309 [*1994 Implementing Agreement*].
[98] *Ibid* art 2.
[99] Vladimir Kopal, "Outer Space as a Global Common" in *Proceedings of the 40th Colloquium on the Law of Outer Space* (Turin, Italy: AIAA/IISL, 1997). Stanley Rosenfield, "Article XI of the Draft Moon Agreement" in *Proceedings of the 22nd Colloquium on the Law of Outer Space* (Herndon VA: AIAA/IISL, 1979) 209. [*Kopal*].

prevent the use of outer space for military purposes. The issue had nothing to do with the exploitation of resources at that time.[100] Both areas are governed by instruments qualified as "confidence-builders for East-West relations."[101] The Antarctic Treaty was initially negotiated among interested countries. After its adoption, the group of countries was enlarged and an international consultation was put into place which has proven to be very efficient.

In many ways, the three treaties contain similar principles. For instance, the use of an international area for peaceful purposes is common to the three treaties such as in the 1959 Treaty Art I, the preamble and art IV of the Outer Space Treaty, the preamble and several provisions of the Law of the Sea[102]. The UN Charter's[103] fundamental objective is to maintain international peace and security. It is of particular importance when dealing with the exploitation of space natural resources.

While Outer Space, including the Moon and celestial bodies are governed by the principle of freedom of exploration and use,[104] the Antarctic Treaty and UNCLOS contain the principle of freedom of scientific investigation[105] and freedom of navigation on the high seas. The spirit behind those provisions is clearly the same. The principle of freedom of scientific investigation applies[106] and international scientific cooperation is

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[100] See online: < http://www.armscontrol.org/documents/outerspace> (date accessed: March 13, 2012).
[101] Malenovsky, *supra* note 4. "They reflect thus optimally the balance of interests between the industrially developed capitalist and socialist countries, but to a lesser degree the interests of the developing nations."
[102] *UNCLOS, supra* note 68, art 88, 141 and 301.
[103] *Charter of the United Nations*, 26 June 1945, Can TS 1945 No. 7 art 1 [*UN Charter*]:
The Purposes of the United Nations are:
1. To maintain international peace and security, and to that end: to take effective collective measures for the prevention and removal of threats to the peace, and for the suppression of acts of aggression or other breaches of the peace, and to bring about by peaceful means, and in conformity with the principles of justice and international law, adjustment or settlement of international disputes or situations which might lead to a breach of the peace;
2. To develop friendly relations among nations based on respect for the principle of equal rights and self-determination of peoples, and to take other appropriate measures to strengthen universal peace;
3. To achieve international co-operation in solving international problems of an economic, social, cultural, or humanitarian character, and in promoting and encouraging respect for human rights and for fundamental freedoms for all without distinction as to race, sex, language, or religion; and
4. To be a centre for harmonizing the actions of nations in the attainment of these common ends.
[104] Outer Space Treaty art I, *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, 610 UNTS 205, 18 UST 2410, TIAS No. 6347 [*Outer Space* Treaty] and Moon Agreement art 4, *supra* note 25.
[105] *1959 Antarctic Treaty*, *supra* note 33 art II; *UNCLOS*, *supra* note 68 arts 36, 87 and 90.
[106] *1959 Antarctic Treaty, ibid* art II, *Outer Space Treaty, supra note 104* art I and *UNCLOS supra* note 68. arts 87, 143, 238 and 240.

encouraged.[107] In both cases, the Moon Agreement goes further by adding a non-discrimination principle and also demanding respect for the principle of equality. International cooperation is the guiding principles in all three areas.[108] Article 4 of the Moon Agreement adds the possibility of negotiating and adopting additional agreements. This could be useful in the event that Parties, for instance, decide to build a lunar base for which a dedicated agreement is required. This provision needs to be maintained in any future regime.

Similarities can also be found in other domains. Provisions related to the obligation of information[109] are present in all three areas. These obligations derive from the spirit of cooperation that underlies the different agreements. The non-appropriation principle is also common to the different areas and it is necessary to keep the fundamental principle of prohibition of sovereignty over the area.[110] Commonalities can also be found in jurisdiction and control mechanisms, notably over installations and personnel.[111] The principle of State responsibility and liability for damage also needs to be pursued.[112] The establishment of military bases and fortifications and the testing of weapons are forbidden in the Antarctic Treaty[113] and the 1967 Outer Space Treaty.[114] However, article 3 of the Moon Agreement contains stronger provisions. Nuclear activities are also prohibited: nuclear explosions and the disposal of radioactive waste material in the Antarctic[115], nuclear weapons in orbit[116]. The Law of the Sea has specific rules for warships and military aircraft.

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[107] *Antarctic Treaty, ibid* art III, *Outer Space Treaty, ibid* art I and the Law of the Sea *supra* note 68 art 143.
[108] *Outer Space Treaty, ibid* art III, IX, *Law of the Sea supra* note 68 arts 138, 150 and *1991 Antarctic Protocol* supra note 36, art 6.
[109] *1959 Antarctic Treaty*, *ibid* art III; *UNCLOS*, *ibid* art 244, *Outer Space Treaty*, *ibid* arts IX and XI and *Moon Agreement, supra note 25* arts 5, 7, 9 and 12.
[110] On the issue of sovereignty and non-appropriation principle, see: *1959 Antarctic Treaty*, *ibid* art IV; *UNCLOS*, *ibid* art 89, *Outer Space Treaty*, *ibid* art II; and *Moon Agreement*, *ibid* art 11(2).
[111] *1959 Antarctic Treaty*, *ibid* art VIII; *UNCLOS*, *ibid* arts 92 and 94; *Outer Space Treaty*, *ibid* art VIII; and *Moon Agreement*, *ibid* art 12.
[112] *1991 Protocol on Environmental Protection*, *supra* note 36 art 16; *UNCLOS*, *ibid* art 235; *Outer Space Treaty*, *ibid* arts VI and VII; and *Moon Agreement*, *ibid* art 14.
[113] *1959 Antarctic Treaty supra* note 33 art I.
[114] *Outer Space Treaty supra* note 104 art IV.
[115] *1959 Antarctic Treaty supra* note 33 art V.
[116] *Supra* note 114.

The protection of the environment is a common concern to the three areas: in the Antarctic Treaty [117]; the Outer Space Treaty[118] deals with the need to conduct exploration so as to avoid harmful contamination and adverse changes in the environment of the Earth; and the Law of the Sea convention contains several measures on pollution[119] including provisions to prevent reduce and control pollution, as well as enforcement measures.[120] In this regard, the introduction of an impact assessment process could be an interesting provision before any activity takes place. Respect of international law is a fundamental provision to be kept in the development of a regime on space natural resources exploitation[121]. Finally, commonalities can also be found in emergency situations and assistance.[122]

These key principles are of importance for the present study. They constitute the fundamental rules applicable to international areas and they require particular attention when dealing with legal mechanisms to govern the exploitation of space natural resources. Although the content sometimes differs slightly to take into account the particular characteristics of a specific area, the spirit behind these principles has commonality. The content of the provisions in the Antarctic Treaty and UNCLOS reinforces their relevance for a future regime to be put in place relating to natural resources.

3.2 DIFFERENCES AND LESSONS LEARNT FOR NATURAL RESOURCES IN SPACE

The international conventions governing the Antarctic, the Sea and Outer Space differ, however, in many respects. In terms of negotiating history, the Outer Space Treaty was entirely prepared under the auspices of the United Nations, with the consensus principle at play. Thus, from the very beginning, developed and developing countries were included in the negotiation of the Outer Space Treaty. On the contrary, the Antarctic

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[117] *1959 Antarctic Treaty supra* note 33: nuclear explosion and radioactive waste, art V, Annex IV on the Prevention of marine pollution.
[118] *Outer Space Treaty supra* note 104 art IX.
[119] *Law of the Sea Convention supra* note 68 art 194 Measures to prevent, reduce and control pollution of the marine environment and art 195 Duty not to transfer damage or hazards or transform one type of pollution into another and art 206 on assessment of potential effects of activities.
[120] *Ibid* art 207-222.
[121] *Outer Space Treaty supra* note 104 art III, *Moon Agreement supra* note 104 art 2, *1959 Antarctic Treaty supra* note 33 art V.
[122] *1991 Protocol on Environmental Protection*, *ibid* art 15; *UNCLOS*, *ibid* art 98, *Outer Space Treaty*, *ibid* art V; and *Moon Agreement*, *ibid* arts 10, 12 and 13.

Treaty was negotiated by mostly developed countries who remained the exclusive signatories and parties thereto in the first few years after the treaty came into force. This difference in negotiating circumstances had an impact upon the resulting international agreements and how they are implemented. Whereas COPUOS is a Committee of the UN, the system in place for the Antarctic allows flexibility via international consultation. While outer space has not been physically defined,[123] the law of the Sea contains clearly defined delimitations.

Since the beginning, activities in Antarctic were conducted with respect to cooperation and interaction among States Parties thanks to formalised meetings. Consultative Meetings held under the Antarctic Treaty have shown a true efficiency and such an approach would be interesting to follow in space once the regime is in place. This would certainly help the different stakeholders to broadly exchange information and address matters of mutual concern. While the Antarctic Treaty[124] and the Law of the Sea[125] provide mechanisms for the settlement of disputes, the outer Space Treaty does not. The Moon Agreement provides a consultation mechanism in its article 15, and without prescribing a solution, encourages States Parties to "settle […] dispute[s] by other peaceful means of their choice." The reference to the 1970 Declaration on Principles of International Law concerning Friendly Relations and Cooperation among States in article 2 of the Moon Agreement is not sufficient. This essential element is missing: as stressed by van Traa-Engelman,[126] settlement of dispute would increase broader acceptance and trust in this field of international law. Such provisions are important for purposes of ensuring a fast and efficient resolution of conflicts. Part V of UNCLOS allows maximum

[123] International space does not define where outer space starts. The only text dealing with this topic is to be found in the Disarmament Conference, "the Draft Treaty on the Prevention of the Placement of Weapons in Outer Space, The Threat or Use of Force against Outer Space Objects." Art 1 states: "the term "outer space" means space beyond the elevation of approximately 100 km above ocean level of the Earth." Draft online from the Ministry of Foreign Affairs of the Russian Federation, online: <http://www.ln.mid.ru/brp_4.nsf/e78a48070f128a7b43256999005bcbb3/0d6e0c64d34f8cfac32573ee002d082a?OpenDocument > (date accessed: June 25, 2012).

[124] *1959 Antarctic Treaty*, *supra* note 33 art XI.

[125] *UNCLOS*, *supra* note 68 Part XV on settlement of disputes; art 279-299; art 186, the Seabed Disputes Chamber of the International Tribunal for the law of the Sea.

[126] Hanneke van Traa-Engelman, "Settlement of Space Law Disputes" (1990) 3 Leiden J Int'l L 139 [Traa-Engelman].

flexibility for the State Parties in their choice of procedure.[127] Strong provisions on the settlement of disputes need to be in place in any future regime on the exploitation of space natural resources. Finally, while the Outer Space Treaty does not have any review clause, the 1991 Protocol requires a review conference to be held 50 years after its entry into force.[128] UNCLOS also provides for the possibility to propose amendments after 10 years.[129] The Moon Agreement provides that 10 years after its entry into force, the question of review of the Agreement should be tabled as an agenda item of the UN General Assembly.[130]

Circumscribing the analysis to the content of the legal provisions, with the exception of a dispute settlement mechanism, it can be concluded that there is no fundamental difference between the general provisions governing the three areas. As noted elsewhere in this thesis,[131] there is the need to create a binding legal agreement to govern the exploitation of space natural resources. Based on past experience, the following fundamental provisions should undoubtedly be part of a proposed treaty regime on space natural resources, as a minimum requirement.[132] It is significant to note that these are almost precisely the same as the relevant provisions of the Moon Agreement. This reinforces the importance and significance of these provisions for a future regime on the exploitation of space natural resources:

- Peaceful use
- Freedom of scientific investigation
- Non contamination
- International cooperation
- Right of inspections
- International responsibility and liability

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[127] Howard Schiffman, "The Dispute Settlement Mechanism of UNCLOS: A Potentially Important Apparatus for Marine Wildlife Management" (1998) J Int'l Wildlife L & Pol'y 293 [Schiffman]
[128] *1991 Protocol on Environmental Protection*, *supra* note 36 art 25.
[129] *UNCLOS*, *supra* note 68 art 312 Amendments.
[130] *Moon Agreement supra* note 25 art 18.
[131] See Infra Chapter IV.
[132] See Appendix 1 to this thesis.

- Settlement of disputes

The objective of the above was to analyse the commonalities between the different international texts, based on the legal provisions. The same approach will be taken when looking at regimes specific to natural resources.

IV. THE ANTARCTIC AND THE SEA MODELS: REGIMES SPECIFIC TO NATURAL RESOURCES

This section focuses on the specific regimes established by the Antarctic Treaty and the UNCLOS on the exploitation and utilization of the resources found in Antarctica and the deep seabed respectively. The objective of the analysis is to draw analogies from these regimes that may be adapted for a future regime on the exploitation of space natural resources.

1. LAW OF ANTARCTICA AND THE NATURAL RESOURCES

Initially, the 1959 Antarctic Treaty made no specific provision in connection with the resources of Antarctica. The technology began evolving from the 1960's and as the interest in the resources grew, there developed a large ongoing debate about the resources of Antarctica. Two fundamental Instruments were developed to deal with the issue: the Convention on the Regulation of Antarctic Mineral Resources Activities (CRAMRA) and the 1991 Protocol on Environment protection.

1.1 HISTORY AND CRAMRA

Following the expression of commercial mining interests in the exploitation of the resources of Antarctica, a moratorium was placed on Antarctic mineral resources in 1976.[133] Five years after the announcement of the moratorium, negotiations to define a regime on the resources commenced. After several years of negotiating, a consensus was reached in 1988 and the Convention on the Regulation of Antarctic Mineral Resources Activities (CRAMRA) was adopted in Wellington, New Zealand.[134] CRAMRA contained detailed provisions regarding activities on mineral resources: principles, rules and

[133] See British Antarctic Survey website, online: <http://www.antarctica.ac.uk/about_antarctica/geopolitical/environmental_issues/mining.php> (date accessed: March 13, 2012).
[134] *Convention on the Regulation of Antarctic Mineral Resource Activities*, 2 June 1988, 27 ILM 868 [*CRAMRA*].

institutions were established to provide a detailed framework on activities related to mineral resources. This was a unique legal development in international law.

On a legal point of view, CRAMRA is of particular interest for our present purposes since it is dedicated to detailed mechanisms regarding the exploitation of mineral resources in Antarctica. The preamble recalls the need to use Antarctica exclusively for peaceful purposes. It stresses the importance of an effective regulation of Antarctic mineral resources activities in the interest of the international community as a whole. It is significant to note that in the definitions section of CRAMRA, "mineral resources" refers to all non-living natural non-renewable resources, including fossil fuels, metallic and non-metallic minerals. "Antarctic mineral resource activities" means prospecting, exploration or development, but does not include scientific research activities within the meaning of Article III of the Antarctic Treaty. Article 2 of CRAMRA states the objectives of the Agreement, namely, to:

- assess the possible impact on the environment of Antarctic mineral resource activities;
- determine whether Antarctic mineral resource activities are acceptable;
- govern the conduct of such Antarctic mineral resource activities as may be found acceptable; and,
- ensure that any Antarctic mineral resource activities are undertaken in strict conformity with this Convention.

Special responsibility is given to Antarctic Treaty Consultative Meetings.[135] Mineral resources activities are not allowed outside the framework of the convention,[136] and, within the convention, "no Antarctic mineral resource activity shall take place until it is judged, based upon assessment of its possible impacts on the Antarctic environment and on dependent and on associated ecosystems."[137] CRAMRA promotes cooperation and international participation with other interested parties, including developing countries.[138]

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[135] *Ibid* art 2 on Objectives and General Principles:
[...] The Parties provide through this Convention, the principles it establishes, the rules it prescribes, the institutions it creates and the decisions adopted pursuant to it, a means for: a) assessing the possible impact on the environment of Antarctic mineral resource; activities; b) determining whether Antarctic mineral resource activities are acceptable; c) governing the conduct of such Antarctic mineral resource activities as may be found acceptable; and d) ensuring that any Antarctic mineral resource activities are undertaken in strict conformity with this Convention.
[136] *Ibid* art 3.
[137] *Ibid* art 4.
[138] *Ibid* art 6.

It establishes a mechanism of strict liability of the operator in case damage occurs to the environment. The Sponsoring State may also be held vicariously liable for any environmental damage caused by the Operator.[139] In view of the historical claims made by certain countries over portions of Antarctica, a provision is dedicated to the "protection of legal positions" under the Antarctic Treaty.[140]

CRAMRA contains exhaustive measures on inspection: all stations, installations and equipment connected with Antarctic mineral resource activities as well as ships and aircraft supporting such activities shall be open at all times to inspection.[141] Article 12, however, contains detailed provisions that circumscribe the inspections. Resources activities are prohibited in areas designated as Specially Protected or Sites of Special Scientific Interest. Resources activities may also be prohibited in any area considered as protected for historic, ecological, environmental, scientific or other reasons.[142] Finally, "data and information obtained from Antarctic mineral resource activities shall, to the greatest extent practicable and feasible, be made freely available [...]."[143]

Chapter VI of CRAMRA provides strong mechanisms for the settlement of disputes, including a choice of forum: the International Court of Justice or the Arbitral Tribunal.[144] Chapter II of the convention creates a number of bodies: the Antarctic Mineral Resources Commission; the Advisory Committee; the Special Meeting of the Parties; the Regulatory Committee; and, the Scientific, Technical and Environmental Advisory Committee with detailed objectives and complex mechanisms, as well as a

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[139] *Ibid* art 8.
[140] *Ibid* art 9: Protection of Legal Positions under the Antarctic Treaty:
Nothing in this Convention and no acts or activities taking place while this Convention is in force shall:
a) constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in the Antarctic Treaty area or create any rights of sovereignty in the Antarctic Treaty area;
b) be interpreted as a renunciation or diminution by any Party of, or as prejudicing, any right or claim or basis of claim to territorial sovereignty in Antarctica or to exercise coastal state jurisdiction under international law;
c) be interpreted as prejudicing the position of any Party as regards its recognition or non-recognition of any such right, claim or basis of claim; or
d) affect the provision of Article IV(2) of the Antarctic Treaty that no new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the Antarctic Treaty is in force.
[141] *Ibid* art 11.
[142] *Ibid* art 13.
[143] *Ibid* art 16.
[144] *Ibid* art 56 ff. Art 56 refers to the Annex for an arbitral tribunal.

Secretariat to serve these bodies. The Commission has broad functions including the designation of areas in which resources activities shall be prohibited or restricted, the adoption of measures for the protection of the environment, and the restriction or prohibition of prospecting.[145] Participation in the Advisory Committee is open to all parties. The Committee's duty is to advise the Commission and Regulatory Committees. It is also a forum for consultation and cooperation.[146] Regulatory Committees are established for each area identified by the Commission.[147] The function of the Special Meeting of Parties relates to the identification of areas of Antarctica suitable for possible exploration and development.[148]

The Convention provides a heavy and complex mechanism for the exploitation of minerals. A distinction is made between several stages and different rules are established for each stage. With respect to prospecting,[149] CRAMRA provides that the Commission "shall not confer upon any Operator any right to Antarctic mineral resources." Notification is required at least nine months in advance of the commencement of planned prospecting.[150] A notification requesting the Commission for identification of an area for possible exploration and development of particular resources[151] triggers a meeting of the Commission and the Special Meeting of Parties. Based on the report of the Special Meeting of Parties, the Commission will consider whether or not it will identify an area and will specify the mineral resources or resources for which the area would be identified.[152] After this decision has been made, the relevant Regulatory Committee will do all the preparatory work, notably divide the area in question into blocks in respect of which applications for exploration and development may be submitted; establish fees to be paid and procedures to be followed.[153]

The next step is the application for an exploration permit, containing a detailed description of the Operator, the proposed exploration activities, and a detailed assessment

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[145] *Ibid* arts 21-22.
[146] *Ibid* arts 23-27.
[147] *Ibid* art 29.
[148] *Ibid* art 28.
[149] *Supra* Chapter III.
[150] *Ibid* art 37.
[151] *Ibid* Chapter IV art 39.
[152] *Ibid* art 41.
[153] *Ibid* art 43.

of the environmental and other impacts.[154] The Regulatory Committee must elaborate a Management Scheme which will contain the terms and conditions for exploration and development within the relevant block.[155] Approval of the Management Scheme will allow the grant of an exploration permit by the Regulatory Committee: it "shall accord exclusive rights to the Operator to explore". Finally, the last step is the application for a development permit in the post-application phase.[156] The Regulatory Committee shall meet and determine whether the application contains sufficient and adequate information and issue a development permit.[157] The various application and decision making processes that must be followed in Antarctic is unique in international law. It deserves to be reviewed as it could inspire some mechanisms in space.

While very detailed and complex, the mechanism also contains very strong provisions dealing with resources activities and the protection of the Antarctic environment, as well as rules allowing to a broad range of actors to be involved. “The mechanism created by CRAMRA succeeded at an apparently impossible task: to organise a mining activity on a territory where states do not agree on sovereignty”.[158]

The agreement generated a lot of critics from the beginning. CRAMRA was concluded, despite the absence of known mineral deposits of commercial interest. [159] The objective was to draft a text and generate a consensus; this is where the success of the agreement lies. One of the main concerns however is that despite numerous legal provisions to protect the environment, the regime allowed exploitation of the resources, based on a consensus of the Antarctic Treaty Consultative Parties. Among those parties, some were against such exploitation. In addition, its entry into force required the ratification by key countries like the United States and the Soviet Union, as well as

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[154] *Ibid* art 45.
[155] *Ibid* art 47.
[156] *Ibid* Chapter V art 53.
[157] *Ibid*.
[158] Armel Kerrest, Outer Space as International Space: Lessons from Antarctica, Science Diplomacy, Science Diplomacy: Antarctica, Science and the Governance of International Spaces, Antarctic Treaty Summit 2009, pp 133-142, online <http://www.atsummit50.org/media/book-18.pdf> (date accessed: March 13, 2013). [*Kerrest*].

[159] International agreements to protect the environment and wildlife: report to the Committee on Finance, United States Senate, on investigation no. 332-287 under section 332 of the Tariff Act of 1930. Washington, DC : United States International Trade Commission, [1991], USITC publication, 2351.

countries claiming sovereignty over Antarctica as stated in the report.[160] All these elements played against a successful implementation of the agreement.

This text includes the assumption that mining the resources could be possible, which could be qualified as an "*abuse*" of Antarctica. This assumption, however, became the subject of serious questions. Environmentalists such as Jacques Cousteau along with Greenpeace and the World Wide Fund for Nature were proactive in developing arguments to forbid mining in Antarctica.

Greenpeace was against CRAMRA, considering that Antarctica should be declared a World Park. Mining was considered an unacceptable risk to the unique Antarctic environment, and it would also destabilize the region. The Exxon Valdez oil spill in polar environment reinforced their position.[161] A common press release was issued by Greenpeace, World Wide Fund for Nature and the Antarctic and Southern Ocean Coalition (ASOC) to see the area declared World Park Antarctica[162]. The international status of Antarctica was at the heart of the discussion, closely linked to historical claims made in the past. The principle to provide some States to dispose of common resources was an important issue. After intensive lobbying, the notion of common heritage of mankind was entirely rejected.[163]

As a consequence of this strong lobbying, 19 countries[164] signed the agreement while many others, including France and Australia, refused. As a pre-condition for the CRAMRA to enter into force, the ratification of all State Parties to the Antarctic Treaty

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[160] *Ibid*, p 5-117

[161] About the actions of Greenpeace on CRAMRA, see Gerry Nagtzaam, *The Making of International environmental Treaties*", Neoliberal and Constructivist Analyses of Normative Evolution, Edward Elgar publishing, 2009, p114.

[162] Greenpeace, WWF and ASOC press release online, < http://www.asoc.org/storage/documents/Meetings/ATCM/XXVI/worldparkpress%20release%20english.pdf > (date accessed; March 13, 2012).

[163] Francesco Francioni, "Resources Sharing in Antarctica: For Whose Benefit?" European Journal of International Law, (1990), *1(1): 258-268*. Online EJIL: < http://www.ejil.org/pdfs/1/1/1131.pdf> (date accessed: March 13, 2013).

[164] New Zealand (25/11/1988), Argentina (17/03/1989), Brazil (25/11/1988), Chile (17/07/03/1989), China (28/06/1989), Czechoslovakia (21/11/1989), Denmark (24/02/1989), Finland (25/11/1988), German Democratic Republic (21/04/1989), Japan (22/11/1989), Norway (25/11/1988), Poland (24/02/1989), Sweden (25/11/1988), South Africa (25/11/1988), South Korea (25/11/1988), Union of Soviet Socialist Republics (25/11/1988), United Kingdom (22/03/1989), United States of America (30/11/1988) and Uruguay (25/11/1988). See the list of signatories on the New Zealand Ministry of Foreign Affairs and Trade's website, online <http://www.mfat.govt.nz/Treaties-and-International-Law/01-Treaties-for-which-NZ-is-Depositary/0-Antarctic-Mineral-Resource.php>.

members including those who had historical claims[165] was required. Since none of those States ratified CRAMRA, it never entered into force. Considering the size, complexity and constraints imposed on the Parties in this Convention, it is easy to question, *a posteriori*, how such provisions could have been implemented.

Following this new development in the Antarctic Treaty System, it took only two years for a new instrument to be adopted. In 1991, the Protocol on Environmental Protection to the Antarctic Treaty[166] was signed. The Protocol superseded the CRAMRA and entered into force on 14 January 1998 as a supplement to the 1959 Antarctic Treaty.[167] The Protocol re-enacted some of the provisions of CRAMRA.[168]

The failure of CRAMRA revealed the fragility of the Antarctic Treaty System. It also showed the weight of environmental groups which succeeded to have key nations rejecting the new Convention.

Despite the failure, the content of CRAMRA is of particular importance as a precious source of codification regarding natural resources management in an international area, as a complement to the existing system. As stressed by Professor Kerrest, CRAMRA successfully organizes a mining activity where there is no state sovereignty. According to this author, since the non appropriation principle is codified and respected on the Moon, it would be easier to define the regime over the resources.[169] The protection of the environment measures of CRAMA are of particular interest for a future regime on the Moon.[170] In this regard, impact assessment measures, the definition of acceptable activities to be conducted, the cooperation and international participation, the right of inspection, the definition of protected areas, the respect of other uses (especially scientific uses) as well as settlement of disputes would be important provisions to be used for the exploitation of space natural resources. A system of international bodies could be inspired from CRAMRA too. It is believed however, that

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[165] See US State Department website, online <http://www.state.gov/documents/organization/15282.pdf> (date accessed: March 13, 2012).
[166] *1991 Protocol on Environmental Protection*, *supra* note 36.
[167] *Ibid* art IV.
[168] Jonathan Galloway, "Limits to sovereignty: Antarctica, Outer Space and the Seabed", *Proceedings of the 41th Colloquium on the Law of Outer Space* (Melbourne, Australia: AIAA/IISL, 1998) 80 [Jonathan Galloway].
[169] Kerrest *supra* note 158
[170] Opinion shared with Prof. Kerrest, *Kerrest*, *supra* note 158

successful implementation of international bodies for such topic requires a direct implication of the government for the decisional aspect. As for liability mechanisms, it will be necessary to respect existing space law principles. Some provisions contained in CRAMRA may be a bit more difficult to implement, notably the need to make data and information to the greatest extent feasible free. Finally, it is to note that CRAMRA does not contain any mechanism regarding the sharing of benefits, and will not be helpful in this regard.

1.2 CURRENT REGIME AND CHALLENGES IN ANTARCTIC

The key provision of this Protocol is its article 7, titled "Prohibition of Mineral Resource Activities". It provides that any activity relating to mineral resources other than scientific research shall be prohibited. Mineral resources activities are subject to a completely different process as compared to the CRAMRA and the spirit underlying that convention. With regard to mineral resources, article 25 of the Protocol provides that "the prohibition on Antarctic mineral resource activities contained therein shall continue unless there is in force a binding legal regime on Antarctic mineral resource activities that includes an agreed means for determining whether, and if so, under which conditions, any such activities would be acceptable." The Protocol focuses entirely on addressing environmental concerns: it contains environment principles in its article 3, and dedicated annexes on the protection of fauna and flora as well as the prevention of marine pollution.

The Antarctic Treaty System is considered to have been successful as it has been able to adapt to changing circumstances as the years went by. "The 1959 Antarctic Treaty developed in response to a number of political, legal and scientific concerns over the future of Antarctic. It has proven particularly robust and effective in dealing with these issues during its 40 years of operations." [171] The Antarctic Treaty is "freezing" the political situation, as mentioned by Professor Kerrest. Despite the evolution of the world towards free liberalism and commercial exploitation, state sovereignty has been limited in Antarctica. As noted by Galloway, "States have limited themselves in Antarctic in terms of sovereignty, commerce and military activities and these incremental self-limitations

[171] *Kerrest, supra* note 158.

have created an erosion of sovereignty and the creation of a new world beyond sovereignty."[172] Since the Protocol may only be reopened after 50 years of being in force, article 7 has effectively postponed deliberations on the question of the exploitation of the resources.

As examined below, the Law of the Sea also met great difficulties when dealing with the question of the resources.

2. THE LAW OF THE SEA AND THE RESOURCES

2.1 HISTORY

The deep seabed was not part of the initial UNCLOS negotiations. It was during the first Law of the Sea Convention in Geneva in 1958 that the idea of the common heritage of mankind was born.[173]

It is only when manganese nodules started to generate interest that the evolution occurred[174]. A committee dedicated to the seabed was established in 1967 to look at those questions. The work of the committee eventually culminated in the adoption by the United Nations General Assembly of Resolution 2749(XXV) on 17 December 1970.[175] This Resolution declared that the seabed and ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction (the Area), as well as its resources "are the common heritage of mankind." No State may claim or exercise sovereignty or sovereign rights thereupon, and their use shall be for peaceful purposes only. No exploration for or exploitation of these resources may be conducted outside the "international regime," including an "appropriate international machinery," to be established "by an international treaty of a universal character, generally agreed upon." The notion of "common heritage of mankind" and its implications for the exploitation of the resources of the seabed is of great significance for the present study since the concept also appears in international space law.

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[172] *Jonathan Galloway*, *supra* note 168.
[173] *Pancracio, supra* note 26.
[174] Scott J. Shackelford, "The Tragedy of the Common Heritage of Mankind", Stanford Environmental Law Journal, Vol. 27/2008, pp. 101 – 120, online : <http://ssrn.com/abstract=1407332>. (date accessed: March 13, 2013). [*Scott Shackelford]*.
[175] *GA RES 2749(XXV)*, *supra* note 66.

2.2 THE CURRENT REGIME GOVERNING THE RESOURCES OF THE SEABED AND ITS CHALLENGES

After a review of UNCLOS and Part XI main provisions, the regime implementation and States practice will be analysed.

The key features of the Law of the Sea Convention

Part XI of UNCLOS provides detailed mechanisms regarding the Area. It establishes an organisation and mandates it to take charge of the management of an international area. Further, UNCLOS prescribes detailed rules on the management of the resources of the Area. In spite of the foregoing, the UNCLOS mechanism has resulted in a lot of difficulties. In the Implementing Agreement's definition of resources: (a) "resources" mean all solid, liquid or gaseous mineral resources *in* situ in the Area at or beneath the seabed, including polymetallic nodules; (b) resources, when recovered from the Area, are referred to as "minerals".[176] At that time, these nodules were seen as having a very high economic potential.

The Montego Bay Convention Section 2 describes the different principles applicable to the Area. One of the fundamental articles of the Convention is, without doubt, article 136. It provides: "The Area and its resources are the common heritage of mankind." It establishes a real *res communis* regime where the management of the resources would have to be carried out by all States for the benefit of all.[177] The next article explicitly states that claim or exercise of sovereignty or sovereign rights over any part of the Area or its resources is forbidden, and that "resources are not subject to alienation", and that minerals recovered from the Area may only be alienated under conditions defined by the Convention.[178] States Parties are invited to have a general

[176] *UNCLOS*, *supra* note 68 Part XI art 133.
[177] *Vincent*, *supra* note 27 at 146.
[178] *UNCLOS*, *supra* note 68 art 137: Legal status of the Area and its resources
1. No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof. No such claim or exercise of sovereignty or sovereign rights nor such appropriation shall be recognized.
2. All rights in the resources of the Area are vested in mankind as a whole, on whose behalf the Authority shall act. These resources are not subject to alienation. The minerals recovered from the Area, however, may only be alienated in accordance with this Part and the rules, regulations and procedures of the Authority.

conduct in relation to the Area in respect of the UN Charter and other rules of international law.[179]

UNCLOS establishes a regime of international responsibility on the part of the States Parties for activities carried out by States, state enterprises or their nationals, as well as international organisations.[180] Activities shall be carried out for the benefit of mankind as a whole. The Authority shall provide for the equitable sharing of financial and other economic benefits derived from activities in the Area.[181]

UNCLOS recalls the principle of peaceful purposes[182] in the Area and it provides further that marine scientific research in the Area shall be carried out exclusively for peaceful purposes and for the benefit of mankind as a whole.[183] The convention promotes and encourages the conduct of marine scientific research and dissemination of results

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3. No State or natural or juridical person shall claim, acquire or exercise rights with respect to the minerals recovered from the Area except in accordance with this Part Otherwise, no such claim, acquisition or exercise of such rights shall be recognized.

[179] *Ibid* art 138: General conduct of States in relation to the Area: "The general conduct of States in relation to the Area shall be in accordance with the provisions of this Part, the principles embodied in the Charter of the United Nations and other rules of international law in the interests of maintaining peace and security and promoting international cooperation and mutual understanding."

[180] *Ibid* art 139: Responsibility to ensure compliance and liability for damage:
1. States Parties shall have the responsibility to ensure that activities in the Area, whether carried out by States Parties, or state enterprises or natural or juridical persons which possess the nationality of States Parties or are effectively controlled by them or their nationals, shall be carried out in conformity with this Part The same responsibility applies to international organizations for activities in the Area carried out by such organizations.
2. Without prejudice to the rules of international law and Annex III, article 22, damage caused by the failure of a State Party or international organization to carry out its responsibilities under this Part shall entail liability; States Parties or international organizations acting together shall bear joint and several liability. A State Party shall not however be liable for damage caused by any failure to comply with this Part by a person whom it has sponsored under article 153, paragraph 2(b), if the State Party has taken all necessary and appropriate measures to secure effective compliance under article 153, paragraph 4, and Annex III, article 4, paragraph 4.
3. States Parties that are members of international organizations shall take appropriate measures to ensure the implementation of this article with respect to such organizations.

[181] *Ibid* art 140: Benefit of mankind:
1. Activities in the Area shall, as specifically provided for in this Part, be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States, whether coastal or land-locked, and taking into particular consideration the interests and needs of developing States and of peoples who have not attained full independence or other self-governing status recognized by the United Nations in accordance with General Assembly resolution 1514 (XV) and other relevant General Assembly resolutions.
2. The Authority shall provide for the equitable sharing of financial and other economic benefits derived from activities in the Area through any appropriate mechanism, on a non-discriminatory basis, in accordance with article 160, paragraph 2(f)(i).

[182] *Ibid* art 141: Use of the Area exclusively for peaceful purposes: "The Area shall be open to use exclusively for peaceful purposes by all States, whether coastal or land-locked, without discrimination and without prejudice to the other provisions of this Part."

[183] *Ibid* art 140.

through international cooperation.[184] Specific measures for the protection of the marine environment are also included in the Convention.[185] Finally, a provision is dedicated to the participation of developing States in activities in the Area.[186]

Section 3 deals with the development of the resources of the Area. UNCLOS outlines a specific policy underlying the development of the resources of the area as follows: activities shall "be carried out in such a manner as to foster healthy development of the world economy and balanced growth of international trade, and to promote international cooperation for the over-all development of all countries, especially developing States […].[187]" In furtherance of the foregoing, article 150 sets out policies to foster: the development of the resources of the Area; the rational management of the resources; the increased availability of the minerals derived from the Area to ensure supplies to consumers of such minerals; the promotion of just and stable prices remunerative to producers and fair to consumers; the enhancement of opportunities for all States Parties, irrespective of their social and economic systems to participate in the development of the resources of the Area and the prevention of monopolization of activities; and, the protection of developing countries from adverse effects on their economies or the development of the common heritage of mankind as a whole.

In specifying these production policies, UNCLOS grants a significant role to the Authority. It "shall take measures necessary to promote the growth, efficiency and stability of markets for those commodities produced from the minerals derived from the Area, at prices remunerative to producers and fair to consumers." Production cannot be undertaken unless prior authorization has been granted by the Authority. The operator needs to apply and provide detailed information about his production plans, and the Authority shall have the power to limit the level of production of minerals from the Area.[188] The objective is to support the growth and the market stability of the mineral resources of the Area.[189]

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[184] *Ibid* art 143: Marine scientific research.
[185] *Ibid* art 145: Protection of the marine environment.
[186] *Ibid* art 148.
[187] *Ibid* art 150.
[188] *Ibid* art 151.
[189] *Vincent*, *supra* note 27 at 151.

The main organs of the Authority are the Assembly, the Council and the Secretariat. The Enterprise is an organ of the Authority that is authorized to carry out activities in the Area, as well as transporting, processing and marketing of minerals recovered from the Area. The Enterprise has legal capacity.[190] The Assembly is composed of all members of the Authority,[191] and it is the "supreme organ of the Authority"[192] with the power to establish general policies. The Council - the executive organ of the Authority - comprises 36 members of the Authority elected by the Assembly.[193] Its main role is to establish the specific policies to be pursued by the Authority.[194] The Council has two subsidiary commissions: the Economic Planning Commission and the Legal and Technical Commission.[195] The Economic Planning Commission focuses on mining, management of mineral resource activities, and international trade and economics, whereas the Legal and Technical Commission addresses exploration for exploitation and processing of mineral resources, oceanology, and protection of the marine environment, as well as economic and legal matters relating to ocean mining and related fields of expertise.[196]

Annex III to the Convention sets out the exploitation regime.[197] In order to be able to exploit, there is a need to apply to the Authority with work plans for activities in the Area.[198] Finally the detailed financial regime foresees the payment of a fee to cover the administrative costs of processing the application.[199]

Disputes concerning the resources of the seabed are to be settled by the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea in accordance with

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[190] *UNCLOS*, *supra* note 68 arts 153.2 and 170.
[191] *Ibid* art 159.
[192] *Ibid* art 160: Powers and functions:
1. The Assembly, as the sole organ of the Authority consisting of all the members, shall be considered the supreme organ of the Authority to which the other principal organs shall be accountable as specifically provided for in this Convention. The Assembly shall have the power to establish general policies in conformity with the relevant provisions of this Convention on any question or matter within the competence of the Authority.
[193] *Ibid* art 161.
[194] *Ibid* art 162.
[195] *Ibid* art 163.
[196] *Ibid* arts 164 and 165.
[197] *Ibid* Annex III: Basic conditions of prospecting, exploration and exploitation.
[198] *Ibid* Annex III art 3.
[199] *Ibid* Annex III art 13(2).

the provisions of Part XV of the Convention.[200] The International Seabed Authority organizes, carries out and controls the Area on behalf of mankind as a whole.[201] The International Seabed Authority is composed of all States Parties.[202] Its mandate is to "organize and control activities in the Area, particularly with a view to administering the resources of the area."[203] It is based on the principle of sovereign equality of all members.[204]

Despite its entry into force, UNCLOS III did not get the required support from various countries.[205]

The difficult acceptance of the common heritage of mankind principle in UNCLOS and the 1994 Protocol.

The common heritage of mankind principle in the UNCLOS has been a source of concern for those countries having a strong interest in the resources of the seabed. States practice highlights the difficulties of having a legal regime for natural resources exploitation in an international area.

At the time the Convention was adopted, many developing countries (130 states) did not ratify it.[206] The simple idea to grant an authority, outside national jurisdiction, the management of the natural resources exploitation and the technology transfer was an issue from the beginning for several States. Developing countries were not ready to share the benefits.[207]

The United States has not ratified the 1982 UNCLOS. Several provisions of the convention were (and are still) considered unacceptable by the US. These include provisions dealing with transfer of technology and wealth from developed to undeveloped countries, and the control of pollution of the marine environment. Such provisions were "out of step with the concepts of economic liberty and free enterprise that Ronald Reagan

[200] *UNCLOS*, *supra* note 68 art 186.
[201] *Ibid* art 153.
[202] *Ibid* art 156.2.
[203] *Ibid* art 157.1.
[204] *Ibid* art 157.3.
[205] Chukwumerije Okereke, "Equity Norms in Global Environmental Governance," Global Environmental Governance, Volume 8, Number 3, August 2008, pp. 25-50. [*Okereke*].
[206] *Scott Shackelford, supra* note 174.
[207] *Scott Shackelford, supra* 174.

[then president of the US] was to inspire throughout the world."[208] The regime over the natural resources was a fundamental issue for the United States. In a vote taken in March 2004, the US Senate's Foreign Relations Committee recommended that the US should accede to the treaty.[209] As of today however, the Senate has still not approved the treaty and the topic remains controversial.

Opponents[210] of UNCLOS regime argued that by adopting the convention, a large amount of royalties generated by the US would be transferred to the International Seabed Authority and may eventually end up in the pockets of corrupt States or States that support terrorism. Proponents, on the other hand believe that the US must urgently become Party to the convention as it codifies customary international law and that the US has a lot to gain by signing this convention. They argue that "[...] ratification [of UNCLOS] is more important today than ever before. At a time when America's military and economic strengths are tested, we must lead on the seas as well as on land."[211]

Critics to the common heritage of mankind did not only come from the United States but also other developed countries, underlying its limits. Some criticism even referred to the past: analyzing the theory of commons, S. J. Shackelford recalled in 2007[212] the concept of a tragedy of the commons proposed by William Forster Lloyd, which became popular with Garrett Hardin. Hardin stated: "Each man is locked into a system that compels him to increase his herd without limit - in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin

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[208] Statement from Edwin Meese, US Attorney General under President Reagan, cited in an article related to the Law of the Sea Treaty background. Online: <http://www.unlawoftheseatreaty.org> (date accessed: march 13, 2012).

[209] U.S. Congress. Senate. Committee on Foreign Relations. *United Nations Convention on the Law of the Sea.* March 11, 2004. Washington, U.S. Govt. Print., 2004. 187 p. (S.Exec.Rept. 108-10, 108th Congress, 2nd session.). See also the remarks made by John B. Bellinger III, the United States and the Law of the Sea Convention, at the Law of the Sea Institute, at Boalt Hall School of Law, UC Bereley on November 3, 2008, online: <https://www.law.berkeley.edu/files/5-bellinger%281%29.pdf.> (date accessed: March 13, 2013).

[210] Steven Groves, "U.N. Convention on the Law of the Sea Erodes U.S. Sovereignty over U.S. Extended Continental Shelf", The Heritage Foundation website, online <http://www.heritage.org/research/reports/2011/06/un-convention-on-the-law-of-the-sea-erodes-us-sovereignty-over-us-extended-continental-shelf> (date accessed: March 13, 2012) [Groves].

[211] Thad W Allen, Richard L Armitage and John J Hamre, "Odd man out at Sea" *The New York Times*, (April 24, 2011) The New York Times website, online <http://www.nytimes.com/2011/04/25/opinion/25allen.html> (date accessed: March 13, 2012).

[212] *Scott Shackelford, supra* 174.

to all." [213] Considering the lack of support for Part XI of UNCLOS, and at the insistence of the United States, the UN General Assembly by Resolution[214] adopted the 1994 Implementing Agreement as a means of finding a suitable legal regime to govern the Area. Article 2(1) of the Implementing Agreement specifies that the provisions of the Agreement and Part XI shall be interpreted and applied together as one single instrument.

The 1994 New York Agreement significantly modifies the original regime created by Part XI of UNCLOS. The fundamental changes are the following: the Enterprise as initially defined disappears: the functions of the Enterprise are transferred to the Secretariat and the financial conditions are no longer applicable, they have been replaced by some vague mechanisms.[215] The Council is invested with decision-making power within the Authority so that developed States have given themselves a veto power in the decision-making process; the provisions related to the control of production are also removed. In the end, the Authority as envisaged in the Part XI of UNCLOS is not the same. Its nature has changed as the mandatory technology transfer was abolished, and the common heritage principle denied as private economic activities became feasible.[216] The 1994 Agreement recognizes "that political and economic changes, including in particular the growing reliance on market principles, have necessitated the re-evaluation of some aspects of the regime for the area and its resources.[217] The main consequence is an immediate increase of the ratifications.[218]

Although the Agreement objective was to foster wider acceptance of the UNCLOS regime, it removed all the key provisions that catered for the interests of developing countries. As a consequence, it opened the door tor more private economic activity.[219] As stated by Scott Shackelford, "the episode demonstrates the limits of internationally acceptable equitable benefit sharing."[220] He explains that this new regime,

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[213] Garrett Hardin, "The Tragedy of the Commons", published in Science, December 13, 1968. 162 Science, 1243, 1244 (1968). Online: <http://www.garretthardinsociety.org/articles/art_tragedy_of_the_commons.html.>. (date accessed: March 13, 2012).
[214] *1994 Implementing Agreement*, supra note 97.
[215] *Vincent*, *supra* note 27 at 154.
[216] *Scott Shackelford, supra* 174.
[217] *Galloway, supra* note 168.
[218] *Pancracio, supra* note 26, p339.
[219] *Scott Shackelford, supra* 174.
[220] *Scott Shackelford, supra* 174.

as adopted in 1994, is in favour of more property rights in the Area, far from the notion of commons or common heritage of mankind. This opinion is shared by Professor Galloway in 1998: "what may be underway (...) is an affirmation of private enterprise and the market (the invisible hand) for developing and allocating the resources of the deep seabed rather than the apparent legal regime in force based on the idea of "equitable sharing of financial and other economic benefits derived from activities in the area...".[221]

With the technology progress, seabed exploitation is becoming an economic reality. One of the main tasks conducted by the Authority over the last few years was the elaboration of exploitation contracts. The Authority has also set rules in connection with the Area: the Mining Code comprises all the texts States need to apply when working on a deep seabed with the International Seabed Authority. The first major text was adopted in 2000 - the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area.[222] In 2010, a new set of Regulations was adopted on Prospecting and Exploration for Polymetallic Sulphides.[223] In 2012, the Regulations on Prospecting and Exploration for Cobalt-Rich Crusts were adopted. It is important to note that those contracts were not only granted to States but also to the international consortia.

The Authority is now more interested in other mineral resources as their exploitation could be of more interest as compared to the polymetallic nodules.[224] With the scarcity of the earth resources, countries will need to drill the deep seabed to extract precious resources. Japan recently succeeded in exploiting a frozen gas from methane hydrates. This new energy could replace traditional sources of energy such as oil, or nuclear sources of energy.[225] With an increasing interest in biodiversity, several countries

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[221] *Galloway, supra* note 168.
[222] *Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area*, International Seabed Authority website, online at <http://www.isa.org.jm/files/documents/EN/Regs/PN-en.pdf > (date accessed: March 13, 2012).
[223] *Regulations on Prospecting and Exploration for Polymetallic Sulphides*, International Seabed Authority website, online online at < http://www.isa.org.jm/files/documents/EN/Regs/PolymetallicSulphides.pdf> (date accessed: March 13, 2012).
[224] *Beurier, supra* note 28 at 1105 paragraph 753.04.
[225] Sara Reardon, "Japan taps "fiery ice" fuel from seabed", Short Sharp Science, New Scientist, 12 March 2013, online NEWSCIENTIST: <http://www.newscientist.com/blogs/shortsharpscience/2013/03/japan-taps-methane-hydrate-fro.html> (date accessed: March 13, 2013).

have issued patents for activities conducted in the deep seabed, with interesting application on Earth, for example in the pharmaceutical domain.[226]

Considering the legal difficulties that remain, notably the fact that the United States has not ratified the UNCLOS III, a proper regime will certainly need to be addressed at some point. Some authors believe that there are enough countries which would agree to go in that direction.[227] Peter Prows considers that the lack of consensus on the intellectual property rights regime "should provide impetus enough for a new bargained consensus", a balance could be defined between patent related rights and equitable sharing of benefits.

The common heritage of mankind' failure to succeed in UNCLOS is not sufficient to state that the principle shall be removed from all other international areas legal regime. Like for CRAMRA, several provisions from Part XI could be of interest for a future regime on space natural resources exploitation. It is notably the case for the forbiddance of claim or sovereignty, the respect of the UN Charter and other rules of international law, the international responsibility of States and liability for damages, the transfer of technology to developing States and the promotion of effective participation of developing States.

3. COMPARATIVE ANALYSIS

3.1 LESSONS LEARNT FROM ANTARCTICA AND THE SEA

The issue of natural resources was addressed neither in the 1959 Antarctic Treaty nor in the 1967 Outer Space Treaty. In both cases, it was not considered urgent enough to deserve any attention. In the case of Antarctica, the claims made by a number of states were a big obstacle to any decision on this issue.[228] As noted by Kopal, if the question of

[226] Salvatore Arico and Charlotte Salpin, "Biopropspectig of Genetic Resources in the Deep Seabed : Scientific, Legal and Policy Aspects", 20-21 (UNU-IAS Report 2005), online IAS: <http://www.ias.unu.edu/binaries2/DeepSeabed.pdf.> (date accessed: March 13, 2013).
[227] Peter Prows. Tough Love: The Dramatic Birth and Looming Demise of UNCLOS Property Law (and What Is to Be Done About It), Texas International Law Journal, 2007, Vol. 42, pp 241-440 online TILJ: <http://www.tilj.org/content/journal/42/num2/Prows241.pdf > (date accessed: March 13, 2013) [Prows].
[228] Kopal, *supra* note 99. "At the time of elaboration of the main space law instrument, these problems still seemed to be remote and the vogue for these issues did not yet emerged."[sic]

outer space resources had been on the agenda, the timely finalisation of the outer space treaty could have been prejudiced. Instead, the outer space treaty encouraged international consultation.

The question of claims is a fundamental theme for the present study. The specific case of collection of mineral resources to support a mission in space is not envisaged in the Outer Space Treaty. The Moon Agreement, however, provides for the establishment of a regime as soon as the exploitation of the resources of the Moon and other celestial bodies is to become feasible. On the question of non-appropriation, article IV of the Antarctic Treaty neither recognizes nor refuses claims. Article II of the Outer Space Treaty is very clear: appropriation is prohibited without limitation in time. Article IV of the Antarctic Treaty and article 7 of the 1991 Protocol strongly limit sovereignty by imposing a ban on mineral resources activities; whereas the Outer Space Treaty does not limit commercial exploitation of outer space. The Antarctic Treaty System's ban on resources activities may only be discontinued if a binding legal regime is established. So far, no such regime has been established and it would appear that there are many difficult obstacles to establishing such a regime.

On the question of territorial sovereignty, article IV(2) of the Antarctic Treaty appears to be much more comprehensive than in article II of the Outer Space Treaty. Article IV(2) of the Antarctic Treaty provides: "No acts or activities taking place while the present Treaty is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctic or create any rights of sovereignty in Antarctic. No new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctic shall be asserted while the present Treaty is in force."[229] Article 137 of UNCLOS also forbids any claim or exercise of sovereignty or sovereign rights over any part of the area or its resources. UNCLOS makes a distinction between *in situ* deep seabed resources[230] and removed resources (minerals). With respect to *in situ* deep seabed resources, UNCLOS prohibits any appropriation of any part of the area or its resources by

[229] *1959 Antarctic Treaty*, *supra* note 33 art IV(2).
[230] *UNCLOS supra* note 68 art 137(1) and 89.

states, private natural and juridical persons. On the basis of article 137(2),[231] *in situ* deep seabed resources are not subject to alienation. On the other hand, removed resources (minerals) recovered from the area may be alienated in accordance with Part XI of UNCLOS. Thus, the convention makes a clear distinction between claims of territorial title to the deep seabed "area" and its resources, which are explicitly prohibited and the exploitation of such resources which is permitted in accordance with the detailed procedures established by the convention.

For Kopal,[232] although both the Antarctic Treaty and UNCLOS use the term "national appropriation", the solution is like a prohibition of national appropriation. It is the result of a compromise to freeze the sector claims. Article 89 of UNCLOS invalidates claims of sovereignty over the high seas. It states that "No State may validly purport to subject any part of the high seas to its sovereignty". Article 137(1) of UNCLOS[233] contains a ban on national appropriation concerning the area of the seabed and ocean floor and subsoil thereof, beyond the limits of national jurisdiction. In Kopal's view, this provision clearly deals with the issue of non-appropriation. It can be concluded that the parallelism between the three regimes is strong.

In order to determine whether these mechanisms are potential models for a regime on the exploitation of space natural resources, it is first necessary to assess whether the Antarctic regime and the law of the Sea have succeeded in providing satisfactory measures regarding the natural resources of Antarctica and the deep seabed, respectively.

With regard to the UNCLOS regime, it would seem that the current system is not entirely satisfactory. By attempting to involve all countries, the UNCLOS regime has fallen victim to the difficult problem of attaining international consensus. Despite all the strong mechanisms contained in the UNCLOS regime, following the 1994 changes, failed to include the interest of developing countries.

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[231] *UNCLOS*, *supra* note 68 art 137(2): "All rights in the resources of the Area are vested in mankind as a whole, on whose behalf the Authority shall act. These resources are not subject to alienation. The minerals recovered from the Area, however, may only be alienated in accordance with this Part and the rules, regulations and procedures of the Authority."

[232] Kopal, *supra* note 99.

[233] *UNCLOS*, *supra* note 68 art 137(1): "No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof. No such claim or exercise of sovereignty or sovereign rights nor such appropriation shall be recognized."

The focus on political and environmental issues under the Antarctic Treaty system led to the adoption of some rather drastic measures[234]. We can consider that what happens in the Antarctic is an anticipation of what will happen in outer space. In outer space, we are starting to discover interesting potential resources but access remains very difficult. A ban on resources exploitation would be satisfactory to protect the area until a regime is established. It is a protective measure that could assist in overcoming the current legal uncertainties. However, in the long term, when exploitation of the resources becomes feasible, continuation of the ban will not be satisfactory. The Moon Agreement requires the establishment of a legal regime. So why not start directly with such a regime instead of postponing the issue again?

3.2 CONSEQUENCES FOR SPACE NATURAL RESOURCES

The failure of the common heritage of mankind within the UNCLOS and the 1994 New York Agreement are used as a "fruitful analog for analyzing disputes surrounding property rights in outer space and the Arctic".[235] Is this analogy sufficient to remove the principle in the future regime that will govern space natural resources exploitation?

While avoiding the complex and demanding regimes such as those established by Part XI of UNCLOS or CRAMRA, a simple and efficient legal framework that will attract the support of the international community must be established. The international regime needs to be based on the fundamental principles studied. In addition, several elements will need to be taken into account, some of them inspired by the Antarctic Treaty System and the UNCLOS regime. It is necessary to make a distinction between the fundamental principles and the structure to be set up around those principles.

The concept of common heritage of mankind does not prevent the exploitation of the resources; it rather prevents the exercise of sovereignty over them. The common heritage of mankind principle is not an obstacle to the exploitation of resources as such. It shall be considered as a political principle. While permitting exploitation, States need to understand the fact that outer space is not a normal place of business.

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[234] *1991 Protocol supra* note 36 art 7.
[235] *Scott Shackelford, supra* 174.

For decades, commercial activities such as telecommunications, remote sensing and navigation have been carried out in outer space. The same cannot be said about Antarctica, nor the deep seabed or the Moon. It is important to note, however, that to date commercial exploitation of space has occurred in the void of space and not on the surface of the Moon or other celestial bodies in space. Those activities are conducted on the basis of an international framework that does not require fundamental change. As noted above, exploration of the "ground territory" in space has also occurred on the Moon and Mars, as well as Venus, Titan and some asteroids, but it has so far been strictly dedicated to scientific purposes and limited to sample removal and collection, principally from the Moon. Use of the ground territory of Antarctica has also been limited to scientific investigations for the most part. In both areas, commercial interest in exploitation of the resources is growing. Claims have already been made in Antarctica and legal measures have been taken in response.

The current legal regime related to the Antarctic does not offer a suitable solution for a future regime governing the exploitation of space natural resources. However, despite the criticism around those texts, some of CRAMRA provisions UNCLOS Part XI could inspire a future regime for space natural resources. As analyzed, some provisions could be used as well as the mechanisms related to international bodies. Despite the failure of CRAMRA, the drafters went far in the elaboration of a regime on natural resources exploitation. UNCLOS Part XI, despite the critics and the changes which occurred in 1994 due to an increasing reliance on market and liberalism, was able to define fundamental mechanisms for natural resources exploitation. The sea is an economic reality, outer space will soon be, but today the gap remains. As analyzed, current rules governing the law of the sea require adaptation to draw a satisfactory property rights regime. Space will benefit from this regime evolution.

The final portion of this study identifies the findings and makes a proposal outlining possible requirements for a future regime on the exploitation of space natural resources, based on the comparative analysis presented in this chapter.

CHAPTER VI: FINDINGS, CONCLUSIONS AND A PROPOSAL

I. INTRODUCTION

Recent developments in the international space community show that the exploitation of space natural resources "is [about] to become feasible"[1]. In accordance with the provisions of art 11(5)[2] of the Moon Agreement, the time is ripe to begin considering an appropriate international legal regime to govern the exploitation of the resources. Any such regime must facilitate the exploitation of the resources by reducing the legal, environmental and financial risks associated therewith.

This study has highlighted the difficulties encountered in regulating resource exploitation in Earth-based international areas such as the High Seas and Antarctica. The Law of the Sea Convention and the 1994 Protocol implementation have led to tremendous issues notably on the exploitation of the resources in the area.[3] The environmental but mainly commercial dimension is such that still today the United States has not ratified UNCLOS III.[4] Despite some attempt to define a detailed regime over the resources management in Antarctica, the discussions failed to reach a consensus and there is a ban on Antarctic resources for a limited period of time, postponing the problem to a later date.[5] Despite those challenges, there are valuable lessons that may be drawn from the law of the Sea and the Antarctic Treaty System for purposes of designing and developing an appropriate international legal regime to govern the exploitation of space natural resources[6]. Since no codification of space law occurred in the last decades, it is

[1] *Supra* Chapter II, II, 2, The exploitation of space natural resources is inevitable, 3. New trends in space exploration and impact on the study. See notably the new paradigm that has taken place in space recently and the multiplication of private initiatives in this matter.
[2] *Agreement Governing the Activities of states on the Moon and other Celestial Bodies*, 18 December 1979 1363 UNTS 3, 18 ILM 1434 art 11(5) [*Moon Agreement*]: "States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible […]."
[3] *Supra* Chapter V, IV, 2, The law of the Sea and the resources.
[4] *Supra* Chapter V, IV, 2.2, The current regime governing the resources of the seabed and its challenges.
[5] *Supra* Chapter V, IV, 1.2,Current regime and challenges in Antarctic.
[6] *Infra* I Findings and IV Proposal.

indispensable to take into account recent developments in international law to understand and adapt the future regime[7].

A solid regime relating to space natural resources exploitation must be based on the fundamental legal principles applicable to outer space[8] and must provide the necessary mechanisms to protect future actors while preserving the environment of the Moon and celestial bodies. The law cannot eradicate the conflicts. However, by defining principles, it may limit the emergence and development of political tensions which could lead to international crisis or prevent future generations from having access to space natural resources.

II. FINDINGS

The following questions were identified at the beginning of this thesis[9]:

- Whether the existing body of international space law is sufficient to appropriately address the legal issues related to the future exploitation of space natural resources;
- What would be an appropriate legal instrument;
- Would it be accepted by the international community, are the provisions of the Moon Agreement sufficient to constitute a future regime on resource exploitation;
- What needs to be done to protect the interests of the private sector.

These main findings reached at the end of the study are developed below. Finally, a proposal is made to define the essential requirements of a future regime.

[7] *Supra* Chapter IV, III, Contemporary Legal Systems and their Impact on International Law.
[8] *Supra* Chapter III , III, The Moon agreement reinforces the principles of the outer space treaty.
[9] *Supra* Chapter I, General introduction.

1. IS THE APPLICABLE INTERNATIONAL SPACE LAW SUFFICIENT TO APPROPRIATELY ADDRESS THE LEGAL ISSUES RELATED TO THE EXPLOITATION OF SPACE NATURAL RESOURCES?

The Outer Space Treaty[10] contains useful provisions on the exploration and use of outer space. The study provided a detailed analogy between the Treaty and the Moon Agreement[11], concluding that the latter reinforces and elaborates the principles of the 1967 Treaty. The outcome of the comparative exercise is that fundamental principles of space law will equally apply to the exploitation of space natural resources.

Nevertheless, the 1967 Treaty deals with "exploration and use," but not with "exploitation". The study has demonstrated[12] that each of these concepts reflects a different reality. At the time of adoption of the Treaty, exploitation of the natural resources was considered as a remote possibility. But the context has changed and exploitation should now be fully addressed.

The 1979 Moon Agreement was an instrument adopted by consensus. It entered into force in July 1984, and despite the controversies surrounding its negotiation and adoption[13], it is, legally speaking, enforceable. Since the conditions required to form international customary law are not met, notably the consistent state practice needed, it cannot be concluded that the provisions of the Moon Agreement have become customary international law[14]. While the review of the Agreement was foreseen in the text[15]; it did not happen. In addition, the fact that some countries have ratified the Moon Agreement will not change the paradigm since some of them do not have the capacity yet to conduct such space activities. As underlined in the study[16], the debate about the Moon Agreement legal value is fully understandable from a political perspective.

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[10] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, 610 UNTS 205, 18 UST 2410, TIAS No. 6347 art VI [*Outer Space Treaty*].
[11] *Supra* note 2.
[12] *Supra* Chapter III, IV, 3.1.3, Are « exploitation » and « extraction », a « use » ?.
[13] *Supra* Chapter III, II, 1.2, the Moon agreement, subject of controversy since its elaboration.
[14] *Supra* Chapter III, Conclusion.
[15] *Supra* note 2 Moon Agreement art 18.
[16] *Supra* Chapter III Conclusion.

For the above mentioned reasons, the first finding of this study is that the applicable international regime of space law is not sufficient to appropriately address the legal issues related to the potential exploitation of space natural resources.

2. WHAT WOULD BE AN APPROPRIATE INSTRUMENT THAT WOULD SECURE THE IMPLEMENTATION OF A STRONG REGIME ON THE EXPLOITATION OF SPACE NATURAL RESOURCES?

The study finds that the best solution would be to adopt an international treaty[17]. Advisory rules would neither be sufficient nor bring about the legal certainty which will be required before any exploitative endeavours involving space natural resources are commenced. However, considering the difficulty that any international consensus for the adoption of a new treaty would entail, and also considering the inability of the COPUOS framework to produce any new space law treaty over the last three decades[18], elaborating such an international treaty appears to be challenging. The definition of a legal framework related to natural resources within an international area both for the Sea and the Antarctic raised a lot of concerns to governments and organisations. Past experience shows the great difficulties met when trying to adopt international convention[19] to govern the rules related to an international area.

Despite the challenges, there is a need to elaborate an internationally binding agreement containing dedicated provisions to the resources. A treaty is the most efficient means to create new binding international rules. A framework related to the exploitation of natural resources in an international area requires very clear rules. Failures to reach an acceptable convention for the Sea and the Antarctic shall not be a motivation to stop the effort in those areas. The Law of the Sea requires further work to get global acceptance. The situation is even more critical today considering the technological progress and great ambitions of private companies and States over those resources as observed in the last couple of years for the Arctic[20].

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[17] *Supra* Chapter IV, Conclusion.
[18] *Supra* Chapter IV, III, 2, Space law dynamic.
[19] *Supra* Chapter V, see notably all the challenges around the Law of the Sea Convention, the 1994 Protocole and in the Antarctic Treaty System.
[20] *Supra,* Introduction.

These attempts at establishing legal regimes to govern the exploitation of resources in Antarctica and the deep seabed were not entirely successful, but one can wonder what would be the status of Antarctica or the deep seabed today if such regimes had not been adopted.

One can go beyond by asking: what will happen to the deep-seabed if nothing is done to complete and finally agree on a property rights regime over the resources; what will happen the day the ban on the resources of the Antarctic is over? What will happen if no mechanism is in place while some entrepreneurs start mining the moon and exploit its resources?

Since the adoption of the space law pillars, the United Nations Committee on the Peaceful Use of Outer Space Member States have not proposed any fundamental amendments to the Outer Space Treaty or the other space law conventions. The existing space law regime consisting of the five space treaties closely linked between them, and United Nations General Assembly Resolutions has provided legal security to governments. Why would the same level of commitment not be accepted for future codification? Future international convention in space will be accepted once it is in the interest of States to have such codification. However, who has the interest to see resources exploitation the subject of a binding international agreement? One could imagine that it would be either those willing to conduct such activities in a protected legal environment, or those who do not yet have the capacity and would like to secure this possibility and associated rights for the future. In this regard, Third World approach to international law that also exists in international space law could play a role in the future considering the importance granted to environmental issues by this movement[21].

Developing countries have played a significant role in the formulation of international space law, and from the very beginning. As developed by Professor Jakhu, art I of the Outer Space Treaty is in this regard a fundamental provision of the Outer Space Treaty, "[I]t is of a legally substantive nature and creates binding treaty

[21] *Supra* Chapter IV, III, Contemporary legal systems and their impact on international law.

obligations[22]. Space faring nations like China and India could have serious implications on the future regime of the Moon. However, they are familiar with the UNCOPUOS process and as long as one country is opposed to such codification, it is not worth it to try.

With the increasing role of the private actors and a different role given to governments, it could well be that those who were very reluctant to such changes could change position.

3. WOULD IT BE ACCEPTED BY THE INTERNATIONAL COMMUNITY, ARE THE PROVISIONS OF THE MOON AGREEMENT FULLY OR PARTIALLY SUFFICIENT TO ADDRESS THE QUESTION OF RESOURCE EXPLOITATION?

The 1979 Moon Agreement provides useful rules for a future regime on the exploitation of space natural resources. Looking into the future, and assuming that the Moon Agreement is fully applicable and will be respected in the future, it is clear that the content of the Moon Agreement will not be sufficient. It predicts that in the future, exploitation of the resources will occur. However, it postpones the establishment of a regime to govern such exploitation.[23]

What is missing is the part dedicated to exploitation as was foreseen but not developed, as well as the establishment of international bodies. Inspiration could be drawn from some of the legal provisions found in Part XI of UNCLOS and CRAMRA in order to fill the gap in the Moon Agreement[24]. But the broader issue is whether to adapt the Moon Agreement or to draft a new Treaty? Keeping and adapting an existing instrument appears to be easier, but it would be better to have a fresher look with an entirely new treaty. In the present case, considering the achievements already made in connection with the Moon Agreement, it is recommended to simply amend the Agreement to include the exploitation of space natural resources through a legal framework.

The principle of common heritage of mankind was identified as one of the fundamental critical issue in the view of a regime on space natural resources exploitation.

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[22] Ram Jakhu, «Developing Countries and the Fundamental Principles of International Space Law » in New Directions in International Law: Essays in Honour of Wolfgang Abendroth – Festschrift zu einem 75. Geburstag, Campus Verlag, Frankfurt/New York, p 351-373.
[23] *Supra* note 2
[24] *Infra*, IV, Proposal

It was however concluded that the principle should be kept and adapted, taking into account contemporary international law developments, such as the common but differentiated responsibility.[25] The principle seems to show that it helped establish different responsibilities among developed and developing countries. An author suggests that "CDR has been relatively more successful than CHM"[26]. The future regime cannot avoid some mechanisms to ensure some equity among the different countries; this will be again a critical task, but it needs to be done.

The last question is in which forum will this new law be developed? The natural answer would be COPUOS. The Working Group on the Status and Application of the Five United Nations Treaties on Outer Space could be a good starting point to introduce this matter into the future agenda of the COPUOS Legal Subcommittee.[27] However, we have seen that for several decades this forum has been unable to obtain consensus for the drafting of new instruments to address relevant contemporary issues in space law.[28] The current approach has been confined to the endorsement of non-binding "soft law" rules, such as the guidelines on space debris. Should the COPUOS framework not be able to tackle such important topic, the questions of the resources could be the subject of a dedicated international convention outside the traditional space forum. Regardless of the forum, it is fundamental that the regime be subject to consensus.

4. TAKING INTO ACCOUNT THE ABOVE PROPOSALS, WOULD THE INTEREST OF THE PRIVATE SECTOR BE PROTECTED?

For several decades now, the existing international space law regime has provided legal security for the activities of governments and international organisation. "Non-government activities" in space, namely those activities conducted by the private sector, require "authorization and continuing supervision by the appropriate State Party to the Outer Space Treaty". [29]

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[25] *Supr*a Chapter III, IV, 2, the common heritage of mankind does not prevent further commercial activities on the moon.
[26] Chukwumerije Okereke, "Equity Norms in Global Environmental Governance" Global Environmental Governance, Volume 8, Number 3, August 2008, p 33.
[27] *Supra* Chapter I.
[28] See discussion of main developments in contemporary international space law, see *supra* Chapter III.
[29] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, 610 UNTS 205, 18 UST 2410, TIAS No.

An international convention related to the Moon and other celestial bodies and a dedicated regime on the potential exploitation of resources is required for purposes of guaranteeing the efficiency and the protection of the activities and its actors from both the public and the private sectors.

Not only the private sector interests would be taken into account, but the absence of such a regime would clearly be detrimental to them. The study showed that they are the first who need legal clarity and security. No investment in space is made without a clear legal framework. In this regard, the private sector has a lot to gain in having a dedicated framework for the resources space exploitation.

III. CONCLUSION

Answering to the questions raised in the study introduction, the findings are the following: First of all, the applicable international space law regime is not sufficient to answer to the legal issues related to the exploitation of potential space natural resources. Secondly, in order to improve the current situation and secure the implementation of a strong regime on the space natural resources, the adoption of an international agreement is needed. It appears that the Moon agreement is partly sufficient to respond to the question of space natural resources in space. The treaty requires adaptations and wider ratification. Alternative approach would be the definition of a new international convention. Such an approach is expected to fulfill private sector interests.

In this regard, the question which does and will be the fundamental legal challenge is the impact of the common heritage of mankind and the implementation of the sharing of benefits.

The common heritage of mankind principle deserves a particular attention as it answers the need of developing countries and one of its fundamental objectives is to

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6347 art VI [*Outer Space Treaty*]: States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.

preserve the commons for the future generation. Okereke underlines that there were several attempts which failed to incorporate the common heritage of mankind in the Antarctic Treaty System, the Convention on Biological diversity and the UN Framework Convention on Climate Change.[30]

Why the principle shall not be removed from the future regime?

Sacrifice the principle only on the basis that it is not fully compatible with world's economy would be the quickest and easiest solution and open the door to any excess regarding property rights in international areas, to the detriment of the environment, the developing countries and the future generations. Since sovereignty has eroded, the risk is to see a world "global free for all of the marketplace and world industries beyond political control – a world where everything is for sale including what's left of national sovereignty."[31]

IV. PROPOSAL

The objective of the following is to propose an approach for a regime to govern the exploitation of space natural resources.

Fundamental principles: experience in the three areas is strength

Several fundamental principles of the Outer Space Treaty and the Moon Agreement must exist in the future regime on space natural resources exploitation.[32] This is a first layer on general provisions which are also applicable to all other space activities.

This layer could be divided in a first group of principles that should easily generate consensus: respect of international law; peaceful use; freedom of exploration and use, freedom of scientific investigation; international cooperation and non contamination. These principles are present in all international areas, the Sea, Antarctic and space.[33]

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[30] *Okereke, supra* note 26.
[31] Jonathan Galloway, "Limits to sovereignty: Antarctica, Outer Space and the Seabed", *Proceedings of the 41th Colloquium on the Law of Outer Space* (Melbourne, Australia: AIAA/IISL, 1998) 80 [Jonathan Galloway]. Sanford J. Ungar, "Special Interests: Is U.S. Foreign Policy for Salte?" chap. 1 in Great Decisions 1998, (New York: Foreign Policy Associations, 1998).
[32] It is proposed that the fundamental principles of the Moon Agreement as discussed in Chapter III should be kept as part of the new regime.
[33] *Supra* Chapter III, III, and Chapter V, III.

Subject of extensive discussion among scholars, the second group of principles needs also to be part of the future regime. The present study concluded that non-appropriation does not prevent the activities on the Moon nor its exploitation; although treated differently, the principle co-exists in the three areas[34]. The international responsibility and liability of States must also be part of the regime. Space entrepreneurs have deeply criticized this fundamental provision, expressing notably the view that with the increasing role of the private sector, the activities of non-governmental entities shall not any more require authorization and continuing supervision by the appropriate State Party to the Treaty. The study reviewed those critics and concluded that the current mechanism is fully compatible with the exploitation of the resources. The obligation of information is a fundamental element of any regulation in space. The Moon agreement reinforces the principle and will be kept in a future regime to safeguard the different interests[35].

Space natural resources exploitation: future governance needs to take into account equity measures

A second layer consisting of provisions dedicated to the governance of resources exploitation needs to be put in place. In this regard, the objectives set out in article 11(7) of the Moon Agreement[36] could inspire – as guiding principles - the second layer of the new regime. The first objective is "the orderly and safe development of the natural resources of the Moon."[37] The preliminary task will be to define each space natural resource capable of exploitation and to provide a dedicated regime for each of them. When new resources are discovered, the legal regime will have to be adapted. This is the practice followed in connection with the management of deep seabed resources. As reviewed in the study, the law of the Sea regulation adapted to the discoveries, starting with polymetallic nodules, then polymetallic sulphides and more recently cobalt-rich crusts.[38] Special measures will be added to the regime to address specific areas requiring dedicated protection. This is a reflection of the idea of scientific preserves that applies in

[34] *Supra* Chapter III, IV, 1, the non-appropriation principle is reinforced.
[35] *Supra* Chapter III, III.
[36] *Moon Agreement*, *supra* note 2.
[37] *Ibid* art 11(7)(a).
[38] *Supra* Chapter V, IV, 2.2, the current regime governing the resources of the seabed and its challenges.

other international areas. In this regard, the same protection mechanisms exist in the three areas to create international scientific preserves and have dedicated rules for them[39].

The next objective is "the expansion of opportunities in the use of those resources.[40]" In this connection, there is a need to ensure that the regime is defined when the opportunities are clear. For example, space natural resources that are of the highest interest must be given priority in the regime.

Finally the most complex objectives are the "rational management of those resources"[41] and linked to it "[a]n equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon, shall be given special consideration."[42] It seems almost idealistic to believe that detailed binding rules on such an issue will be implemented in the short term. As exemplified by CRAMRA and the 1994 New York Convention, past experience shows that economic interests always prevail. However, although all the benefits will not be shared, there is room for the country to have some aspects share, for example results of scientific experiments.

The common heritage of mankind principle shall evolve to adapt for future challenges, it is a politico-legal concept;[43] it shall not prevent the exploitation of space natural resources in an international area but allow the right balanced between the interests of all countries, the environment and the future generations. As proposed by Scott J. Shackelford,[44] "the international commons must thus evolve to survive." He underlines the fact that "technological progress catalyzes changing political realities and

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[39] *Supra* Chapter III, III, 6, non-contamination and the creation of the international scientific preserve and chapter V, III, 2.
[40] *Ibid* art 11(7)(c).
[41] *Moon Agreement*, *supra* note 2 art 11(7)(b).
[42] *Ibid* art 11(7)(d).
[43] Kunihiko Tatsuzawa, "Political and legal meaning of the Common Heritage of Mankind, in *Proceedings of the 19th Colloquium on the Law of Outer Space* (Tokyo, Japan: AIAA/IISL, 1986) pp 84-89.
[44] He explains that after the Cold War, the progress of technologies contributed to increase the claims over the resources in the commons and illustrates the impact of the technology progress on the law of the Sea from the 1982 Convention to the 1994 Protocol. Scott J. Shackelford, The Tragedy of the Common Heritage of Mankind, Stanford Environmental Law Journal, Vol. 27/2008, pp. 101 – 120, online : <http://ssrn.com/abstract=1407332> (date accessed: March 13, 2012).

thereby governance regimes over the commons." A compromise needs to be found to allow the exploitation of the resources while ensuring a limitation of the rights.[45]

As a consequence, a new regime for the law of the Sea is certainly needed. "To save a regime, sometimes its foundations must be turned and shaken to be set back right.[46] J. Galloway suggests that the marketplace itself and consumer sovereignty could be a protective measure as consumers could show they care for environment.[47]

The traditional dichotomy between developing and developed countries has evolved with the increasing weight on the international scene of China, India, or Brazil to take few examples. These countries support the market-based approach, even when dealing with global environmental management[48]. The 1994 Law of the Sea Protocol is an illustration of the trend and it expanded with international texts on climate change. However, the responsibility falls on advanced countries to ensure a minimum of equity in the management of the resources. At the same time, the international community is increasingly relying on approaches where environmental solutions are taken into account.

Analysis was made regarding CRAMRA and the Law of the Sea attempts to set an international regime for natural resources exploitation. The Wellington Convention was drafted in 1988, the Law of the Sea in 1982. It is not surprising that more than a decade later, the 1994 Protocol outcome was closer to reliance on market and liberalism, compared to the spirit of the text, as initially prepared. CRAMRA will not help in defining the sharing of benefits as already studied, however, fundamental environmental measures could be inspiring for a regime in space. Despite the failure of the common heritage of mankind principle in the Law of the Sea, it was possible to codify on a step by step basis the new resources discovered. A new property rights regime is required in this domain in order to build upon the existing regime and its evolution. Space and the exploitation of space natural resources will benefit from this evolution.

The successful implementation of the above mentioned measures would require the establishment of relevant bodies. This is where both CRAMRA and the law of the Sea

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[45] *Ibid* .
[46] Peter Prows. Tough Love: The Dramatic Birth and Looming Demise of UNCLOS Property Law (and What Is to Be Done About It), Texas International Law Journal, 2007, Vol. 42, pp 241-440 online TILJ: <http://www.tilj.org/content/journal/42/num2/Prows241.pdf > (date accessed: March 13, 2013) [Prows].
[47] *Galloway,* s*upra* note 31.
[48] *Supra* note 30.

are valuable. It will be necessary to set up international bodies dedicated to the management of the space resources. It will be necessary to set up international space natural resources decision-making body composed of all States Parties to the Treaty and based on the principle of sovereign equality of all members. This will organize and control activities related to the resources and define relevant policies. In addition, a space natural resources consultative body will advise the decision-making body based on information exchange and expertise as well as international interaction. Specific bodies must be also created to organize and manage environment impact assessment of all the activities related to space natural resources, whether they are for scientific or commercial purpose. Finally, a financial body must be established to deal with the financial aspects to avoid a pure trans-national business and secure the implementation of an equitable sharing of the benefits.

A crucial final aspect: the political buy-in must be there. Since space leaders probably will not take the initiative, who has interest to do so? Hopefully the common interest of some countries convinced that this area is special, requires specific protection and clear rules before activities occur. Finally, special attention must be given to the environment, developing countries as well as future generations. The question of the sharing natural resources is a question of justice between nations and justice between generations.[49] This approach is applicable on Earth and is also relevant to the next international area, outer space.

Would such regime be endorsed, what could be the degree of adhesion of the above proposals by key actors?

International space law and its application are often misunderstood; there is a need to change its perception. The legal regime is necessary for all the actors: not only those in favour of a universal approach (scientists and future space powers), but also for today's space leaders and the private sector, as well as military and civil industry lobbyists. The regime must be for them all, and clearly seen to be in their interest. Politics need the law and the law is necessary because of the politics: it is a closed cycle and there is a strong interaction between both.

[49] An excellent approach is given in Pierre-Yves Bonin, *La Justice internationale et la répartition des resources naturelles*, (Québec: Presses de l'université Laval, 2010).

From both a technical and a legal perspective, the setting up of an adequate and strong legal regime to govern the exploitation of space natural resources is not difficult. The tools exist and can be adapted. The difficulty rather lies in whether there will be the necessary political will to implement legal provisions.

Finally, the study highlighted the political dimension of the topic[50]. An increasing number of countries are moving to a more liberal system where there is the temptation not to be bound by too many constraints. As shown for other international areas, the Sea and Antarctic, a regime on space natural resources would at the same time satisfy the interest of those in favour of free enterprise (countries having a strong space sector and ambitions, including the private sector, as well as lobbyists working for both) and those in favour of a more universalist approach (mainly developing countries). The political buy-in is today missing, but it could emerge quickly to defend particular interests.

[50] *Supra* Chapter II

Appendix I Joint statement on the benefits of adherence to the Agreement governing the Activities of States on the Moon and Other Celestial Bodies by States Parties to the Agreement. U.N. General Assembly Committee on the Peaceful Uses of Outer Space Legal Sub-Committee Forty-Seventh Session, Vienna 31 March-11 April 2008. Agenda item 6 Status and application of the five United Nations treaties on outer space. A/AC.105/C.2/L.272.

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Legal Subcommittee
Forty-seventh session
Vienna, 31 March-11 April 2008
Agenda item 6
Status and application of the five United Nations treaties on outer space

Joint statement on the benefits of adherence to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies by States parties to the Agreement

Note by the Secretariat

1. At the forty-seventh session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space, the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space considered, among other matters, the issue of the low participation of States in the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.[1]

2. At its second meeting, the Working Group was informed that the delegations of Austria, Belgium, Chile, Mexico, the Netherlands, Pakistan and the Philippines would submit a joint statement on the benefits of adherence to the Moon Agreement by States parties to the Agreement.

3. The Working Group requested the Secretariat to issue the joint statement as a document for consideration at its next meeting.

4. The text of the joint statement is contained in the annex to the present document.

[1] United Nations, *Treaty Series*, vol. 1363, No. 23002.

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Annex

Joint statement on the benefits of adherence to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies by States parties to the Agreement

1. Background

1. At its forty-sixth session, the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space endorsed the report of the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space (A/AC.105/891, annex I).

2. At that session, some representatives expressed the view that consideration should be given to the reasons for the low participation of States in the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies[a] and that efforts should be made to resolve any identified obstacles to participation.

3. Also at that session, the Working Group agreed that during the forty-seventh session of the Legal Subcommittee, in 2008, member States, in addressing the low participation of States in the Moon Agreement, in the framework of the Working Group, could, inter alia:

(a) Address activities currently being carried out or to be carried out on the Moon and other celestial bodies in the near future;

(b) Identify the international and national rules governing activities on the Moon and other celestial bodies;

(c) Assess whether existing international rules adequately addressed activities on the Moon and other celestial bodies.

4. The Working Group also agreed that the Secretariat should prepare a background paper that included information from States parties to the Moon Agreement about the benefits of adherence to the Agreement.

2. Nature of the joint statement

5. The present joint statement is based on the experience of States parties to the Moon Agreement and does not, in any manner, constitute a joint position or an authoritative interpretation of the provisions of the treaties or resolutions mentioned in it. Its sole purpose is to provide the Committee on the Peaceful Uses of Outer Space with elements for reflection in the framework of its activities aimed at the development and wider application of outer space law.

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[a] United Nations, *Treaty Series*, vol. 1363, No. 23002.

3. Rationale and joint statement on the benefits of adherence to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies

6. In response to the agreement reached by the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space at the forty-sixth session of the Legal Subcommittee with regard to information received from States parties to the Moon Agreement on the benefits of adherence to the Agreement, the delegations of Austria, Belgium, Chile, Mexico, the Netherlands, Pakistan and the Philippines submit the present joint statement, which was drafted taking into consideration the following:

(a) The relatively low participation in the Moon Agreement and the fact that some States regularly question whether the Agreement is part of international law or should be considered to be on the same level as the other four United Nations treaties on outer space;

(b) The fact that the text of the Moon Agreement was commended by the General Assembly in its resolution 34/68 of 5 December 1979, in which the Assembly expressed its hope for the widest possible adherence to the Agreement;

(c) The fact that the Moon Agreement has been registered with the Secretariat in accordance with article 102 of the Charter of the United Nations, that it entered into force on 11 July 1984 and that, since then, it has been part of international law;

(d) The growing interest among space-faring countries worldwide in new projects, activities and missions aimed at exploring and using the Moon and other celestial bodies in the Solar System and their resources;

(e) The fact that the Moon Agreement offers a specific international legal framework commended by the General Assembly and accepted by the international community.

7. The delegations of Austria, Belgium, Chile, Mexico, the Netherlands, Pakistan and the Philippines, States parties to the Moon Agreement, jointly emphasize the following aspects and considerations with regard to the benefits of the Agreement and of being a party to it:

(a) Although the Moon Agreement contains provisions that reiterate or develop the principles set out in the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,[b] some of which are specifically applicable to the Moon and other celestial bodies in the Solar System, other provisions contained are unique to the Moon Agreement and constitute its real added value with respect to the other outer space treaties;

(b) Some of the provisions unique to the Moon Agreement are of particular interest for the implementation of projects, activities and missions for one of the following two reasons:

[b] United Nations, *Treaty Series*, vol. 610, No. 8843.

(i) They clarify or complement principles, procedures and notions contained in the other outer space treaties that are applicable to the Moon and other celestial bodies (see article 1, paragraphs 1 and 2; article 3, paragraph 4; article 7, paragraphs 1 and 2; article 10; and articles 12-15 of the Moon Agreement);

(ii) They facilitate international scientific cooperation (see article 5, paragraphs 1-3; article 6, paragraphs 2 and 3; and article 7, paragraph 3, of the Moon Agreement).

(c) In particular, the following provisions give the Moon Agreement added value compared with the Outer Space Treaty:

(i) *Procedures for the establishment of stations (article 9)*. While recognizing, in article 9 of the Moon Agreement, the freedom of States parties to establish stations, States parties recognize that such establishment is subject to reasonable substantive and procedural conditions relating to the location and the installation of the station and the furnishing of information to the Secretary-General;

(ii) *Safeguarding of life and health of persons (article 10)*. The designation of any person on the Moon as an astronaut within the meaning of article V of the Outer Space Treaty and as part of the personnel of a spacecraft within the meaning of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space,[c] offers protection to nationals of States parties;

(iii) *Prohibition of acquisition of property (article 11, paragraph 3)*. The clarification of article 11, paragraph 2, provided in the subsequent paragraph 3, in conjunction with article II of the Outer Space Treaty, is helpful to States parties in rejecting the idle claims to property rights that have surfaced in recent years, in particular since the difference between the two agreements has been used to support those claims;

(iv) *Use of and jurisdiction over vehicles, equipment, facilities, stations and installations (article 12)*. The application of the relevant provisions of the Rescue Agreement offers protection for the vehicles, installations and equipment of States parties. In addition, the Moon Agreement allows States parties to use, in the event of an emergency, the equipment, vehicles, installations, facilities or supplies of other States parties. Moreover, the Moon Agreement clearly states that States parties shall retain jurisdiction over their personnel, space vehicles, equipment, facilities, stations and installations. Such a provision constitutes a fundamental legal element for the implementation of the principles of outer space law;

(v) *Compliance (article 15)*. The attribution to States parties of visitation rights to the vehicles, installations and equipment of other States parties in order to ensure the compatibility of the activities of States parties with the Moon Agreement is comparable to those included in the Antarctic Treaty.[d] The procedure outlined in article 15 is conducive to and in accordance with the

[c] United Nations, *Treaty Series*, vol. 672, No. 9574.
[d] United Nations, *Treaty Series*, vol. 402, No. 5778.

principles of international cooperation that govern activities on the Moon and other celestial bodies;

(d) The most discussed provision of the Moon Agreement is contained in article 11, in which it is noted that the Moon and its natural resources are the common heritage of mankind. That is the only article in the United Nations treaties on outer space that foresees the possibility of exploiting natural resources in outer space. Although such exploitation is not prohibited by international law, it must be considered subject to respect for the principles applicable to outer space, in particular article II of the Outer Space Treaty. By foreseeing the possibility and the feasibility of exploiting natural resources, article 11 of the Moon Agreement offers an obvious legal solution in that respect, subject to respect for article II of the Outer Space Treaty and the other principles of outer space law;

(e) It is remarkable that the Moon Agreement does not propose a closed and complete mechanism. Rather, it adopts an intelligent approach, leaving to the States involved at the time when the exploitation of the natural resources of celestial bodies becomes feasible the responsibility for defining, setting up and implementing such a regime, in accordance with the principle of common heritage of mankind and other principles of outer space law. Such a regime should be established and implemented by taking into account simultaneously the relevant political, legal and technical facts, possibilities and requirements existing at that time. In that respect, the Moon Agreement constitutes a proactive instrument for achieving consensus among all States, taking into account the interests of developing countries. The Moon Agreement does not preclude any modality of exploitation, by public or private entities, or prohibit the commercialization of such resources, provided that such exploitation is compatible with the principle of a common heritage of mankind;

(f) To date, no other solution allowing the possible exploitation of the natural resources of celestial bodies has been proposed under the provisions of the United Nations treaties on outer space;

(g) Finally, the Moon Agreement contributes to preventing the development, placement and use of armament systems and weapons in or from outer space (article 3).

8. Thus, participation in the Moon Agreement offers substantial benefits and guarantees with regard to participation in the other United Nations treaties on outer space. Not only does it offer a better understanding of concepts of international space law and a better description of relevant concepts and procedures, it also, above all, represents a mutual commitment to seeking a multilateral solution for the exploitation of the natural resources of celestial bodies in accordance with the general principles of outer space law.

9. The States parties to the Moon Agreement encourage States that have signed but not yet ratified the Agreement, as well as other States, to become parties to it, in particular considering their possible involvement in forthcoming missions or projects aimed at exploring celestial bodies.

Appendix II Set of Questions provided by the Chair of the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space. U.N. General Assembly Committee on the Peaceful Uses of Outer Space Legal Subcommittee Fiftieth session 28 March-8 April 2011. Agenda item 4 of the provisional agenda. Status and Application of the five United Nations Outer Space Treaties. A/AC.105/C.2/2011/CRP.12.

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Legal Subcommittee
Fiftieth session
28 March-8 April 2011
Item 4 of the provisional agenda*
Status and Application of the five United Nations Outer Space Treaties

Set of Questions provided by the Chair of the Working Group on the Status and Application of the Five United Nations Treaties on Outer Space

Note by the Secretariat

1. This document contains a set of questions prepared by the Chair of the Working Group, as a basis for continued discussion in the Working Group on the Status and Application of the Five United Nations Outer Space Treaties, including questions related to the three topics identified by the Working Group during its forty-ninth session of the Legal Subcommittee in 2010 (A/AC.105/C.2/2010/TRE/L.1).

* A/AC.105/C.2/L.280.

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Questionnaire

1. Issues relating to the Moon Agreement, including possible points of consensus or of concern among States about the Agreement and its implementation

1.1 Do the provisions of the 1967 UN Outer Space Treaty constitute a sufficient legal framework for the use and the exploration of the Moon and other celestial bodies?

1.2 What are the benefits of being party to the 1979 UN Moon Agreement?

1.3 Which principles or provisions of the 1979 UN Moon Agreement should be clarified or amended in order to allow its wider adherence by States?

2. Issues relating to the implementation of the mechanisms of responsibility and liability of the States parties as provided for by the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, and by the Convention on International Liability for Damage Caused by Space Objects

2.1 Could the notion of 'fault', as featured in Articles III and IV of the 1972 UN Liability Convention, be used for sanctioning the non-compliance by a State with the Principles adopted by the UNGA or its subordinate bodies and related to space activities, such as the Resolution on Principles relating to the Use of Nuclear Power Sources in Outer Space (47/68) or the UNCOPUOS Guidelines relating to the Mitigation of Space Debris?

2.2 Could the notion of 'damage', as featured in Article I of the 1972 UN Liability Convention be used to cover the loss resulting from a maneuvre performed by an operational space object in order to avoid collision with a space object or space debris not complying with the UNCOPUOS Guidelines relating to the Mitigation of Space Debris?

2.3 Are there specific aspects related to the implementation of the international responsibility, as provided for in Article VI of the 1967 UN Outer Space Treaty, in connection with the UNGA Resolution on Principles relating to the Remote Sensing of the Earth from Outer Space (41/65)?

3. Issues related to the registration of space objects, notably in the case of transfer of space activities or space objects in orbit, and the related possible legal solutions for the States involved

3.1 Is there a legal basis to be found in the existing international legal framework applicable to space activities and space objects, in particular the provisions of the 1967 UN Outer Space Treaty and of the 1975 UN Registration Convention, which would allow the transfer of the registration of a space object from one State to another during its operation in orbit?

3.2 How could a transfer of activities or ownership involving a space object during its operation in orbit from a company of the State of registry to a company of a foreign State, be handled in compliance with the existing international legal framework applicable to space activities and space objects?

3.3 What jurisdiction and control are exercised, as provided for in Article VIII of the 1967 UN Outer Space Treaty, on a space object registered by an international intergovernmental organisation in accordance with the provisions of the 1975 UN Registration Convention?

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
Scope	**Art 1** 1. The provisions of this Agreement relating to the Moon shall also apply to other celestial bodies within the solar system, other than the Earth, except insofar as specific legal norms enter into force with respect to any of these celestial bodies. 2. For the purposes of this Agreement reference to the Moon shall include orbits around or other trajectories to or around it. 3. This Agreement does not apply to extraterrestrial materials which reach the surface of the Earth by natural means.	**Art I to XIII** deal with "outer space, including the Moon and other celestial bodies"	The scope is the same: outer space and celestial bodies Earth is not included in the celestial bodies MA introduces the possibility to have additional legal provisions on the celestial bodies Understandings on the trajectories: as it does not include trajectories and orbits of space objects in earth orbits only and trajectories of space objects between the earth and such orbits, so that space vehicles are excluded (not assimilated to CHM) MA does not apply to extraterrestrial materials reaching the surface of the Earth by natural means	The MA wording is more complete and shall be maintained in the future regime.
Respect of international law	**Art 2** All activities on the Moon, including its exploration and use, shall be carried out in accordance with **international law**, in particular the Charter of the United Nations, and taking into account the Declaration on Principles of International Law concerning Friendly Relations and Cooperation among States in accordance with the Charter of the United Nations (…) in the interest of **maintaining international peace and security and promoting international cooperation and mutual understanding**, and with due regard to the corresponding interests of all other States Parties.	**Art III** Carry on activities in the exploration and use of outer space, in accordance with **international law**, in the interest of **maintaining international peace and security and promoting international cooperation and understanding**.	Same provisions (international law & maintaining peace…) MA makes a reference to the UN Charter and the Declaration on Principles of International Law concerning Friendly Relations and Cooperation among States: Art 1 of the Declaration states: "States shall refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any State, or in any other manner inconsistent with the purposes of the UN." The provisions related to the settlement of disputes in the Declaration are applicable	Art 2 of the MA is certainly stronger than the OST. It deals with potential activities on the Moon and requires strong international cooperation. While there is no such provision in the Outer Space Treaty, the future regime will need to include dedicated settlement of disputes mechanisms.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
Peaceful purposes Prohibition of certain actions	**Art 3** 1. The moon shall be used by all States Parties exclusively for **peaceful purposes**. 2. Any threat or use of force or any other hostile act or threat of hostile act on the moon is **prohibited**. It is likewise prohibited to use the moon in order to commit any such act or to engage in any such threat in relation to the earth, the moon, spacecraft, the personnel of spacecraft or man- made space objects.	**Art IV** 2. The Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for **peaceful purposes**. (…)	Peaceful purposes mirror principle MA art 3(2) adds new obligations, it goes further. It states a real prohibition.	The Moon Agreement wording will be privileged for SNR as it provides more protection.
Nuclear weapons	**Art 3** 3. States Parties shall not place in orbit around or other trajectory to or around the moon **objects carrying nuclear weapons or any other kinds of weapons of mass destruction or place or use such weapons on or in the moon**.	**Art IV** al 1 States Parties to the Treaty undertake not to place in orbit around the Earth any **objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner**	Mirror provisions, Moon again goes a bit further In the OST: prohibition covers the Earth In the MA: prohibition covers the moon Conventional weapons are not prohibited.	The MA provisions should be maintained in a future regime. This provision raises the question of a possible ban of weapons in space through international agreement.
Military activities	**Art 3** 4. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on the moon shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use	**Art IV** 2. The establishment of military bases, and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes	Mirror provision The MA applies to the moon, adds “and use of the moon” while the OST refers to celestial bodies.	Indispensable to keep the principle in the future regime, intrinsically linked to the peaceful use.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	of any equipment or facility necessary for peaceful exploration **and use of the moon** shall also not be prohibited.	shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited.		
Benefit clause Province of all mankind	**Art 4** 1. The exploration and use of the Moon shall be the **province of all mankind** and shall be carried out for the **benefit and in the interests of all countries**, irrespective of their degree of economic or scientific development. Due regard shall be paid to the **interests of present and future generations** as well as to the need to **promote higher standards of living and conditions of economic and social progress and development** in accordance with the Charter of the United Nations.	**Art I** 1. The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the **benefit and in the interests of all countries**, irrespective of their degree of economic or scientific development, and shall **be the province of all mankind.**	The MA Agreement repeats the OST on the province of all mankind and the space benefit clause. The OST covers outer space while the MA is limited to the Moon. The MA goes a bit further with provisions regarding present and future generations, and the need to promote higher standards of living and conditions of economics and social progress and development.	A proper regime on the exploitation of space natural resources requires moving beyond the statement of general goals and establishing global principles as well as more detailed measures depending on the nature of the resources concerned.
International cooperation & mutual assistance	**Art 4** 2. States Parties shall be guided by the **principle of cooperation and mutual assistance** in all their activities concerning the exploration and use of the Moon. International cooperation in pursuance of this Agreement **should be as wide as possible and may take place on a multilateral basis, on a bilateral basis or**	**Art III** States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international	The MA does not include outer space. It provides the possibility to have additional legal norms: a multilateral basis, on a bilateral basis or through international intergovernmental organizations?	The possibility offered by the MA to draw additional legal norms needs to be kept. If for example MA Parties decide to build a lunar base, a multilateral agreement would certainly be a necessity. This provision is important for the countries which are parties to the MA. As for the natural resources, this mechanism is of upmost relevance. The MA provisions need to be maintained in a future regime.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	through international intergovernmental organizations	cooperation and understanding. **Art IX** (…) States Parties to the Treaty shall be guided by the **principle of cooperation and mutual assistance** and shall conduct all their activities in outer space, including the Moon and other celestial bodies, **with due regard** to the corresponding interests of all other States Parties to the Treaty		
Obligation of information **Dissemination of the information**	**Art 5** 1. States Parties shall inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent fe**asible and practicable**, of their activities concerned with the exploration and use of the Moon. **Information on the time, purposes, locations, orbital parameters and duration shall be given in respect of each mission to the Moon as soon as possible after launching**, while information on the **results** of each mission, including scientific results, shall be furnished **upon completion of the mission**. In the case of a mission lasting more than sixty days, information on conduct of the	**Art XI** In order to promote international cooperation in the peaceful exploration and use of outer space, States Parties to the Treaty conducting activities in outer space, including the Moon and other celestial bodies, agree to **inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable**, of the nature, conduct, locations and results of such activities. On receiving the said information, the Secretary-General of the United Nations should be prepared to disseminate it immediately and effectively.	Both text contain an obligation of information of the UN Secretary General "to the greatest extent feasible and practicable. The MA does not mention outer space. The MA contains additional obligations for the activities on the Moon before and after the activities occur, based on a period of time. The OST foresees dissemination of the information by the UN while the MA does not. One can wonder about the interest to link the obligations to report to periodical sequences of the mission, this may encourage a country not wishing to communicate too much to have a duration above 6 months in order to avoid the obligation to the mission lasting less than 6 months.	These key provisions need to be maintained in the future regime, be applicable to outer space, the Moon and other celestial bodies. A provision on the dissemination of results also needs to be added to be in line with OST.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	mission, including any scientific results, shall be given periodically, at thirty-day intervals. For missions lasting more than six months, only significant additions to such information need be reported thereafter.			
Obligation to inform other Parties when simultaneous plans	**Art 5** 2. If a State Party becomes aware that **another State Party plans to operate simultaneously** in the same area of or in the same orbit around or trajectory to or around the Moon, it shall promptly inform the other State of the timing of and plans for **its own operations.**	**Art IX** If a State Party to the Treaty has reason to believe that an **activity or experiment planned by it or its nationals** in outer space, including the Moon and other celestial bodies, **would cause potentially harmful interference with activities of other States Parties** in the peaceful exploration and use of outer space, including the Moon and other celestial bodies, it shall undertake appropriate **international consultations** before proceeding with any such activity or experiment. A State Party to the Treaty which has reason to believe that an activity or experiment planned by another State Party in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities in the peaceful exploration and use of outer space, including the Moon and	Both texts contain the same objective but a different process.	A country Party to both treaties will have the choice of procedure. As for the future regime, it is proposed to maintain the simple approach offered in the MA.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
		other celestial bodies, may request consultation concerning the activity or experiment		
Global obligation of information	**Art 5** 3. In carrying out activities under this Agreement, States Parties shall promptly inform the Secretary-General, as well as the public and the international scientific community, of **any phenomena they discover in outer space, including the Moon, which could endanger human life or health, as well as of any indication of organic life.**	**Art V** (…) States Parties to the Treaty shall immediately inform the other States Parties to the Treaty or the Secretary-General of the United Nations of **any phenomena they discover in outer space, including the Moon and other celestial bodies, which could constitute a danger to the life or health of astronauts.** **Art XI** State Parties (…) agree to agree to **inform the Secretary-General** of the United Nations as well as the public and the international scientific community, **to the greatest extent feasible and practicable**, of the nature, conduct, locations and results of such activities. On receiving the said information, **the Secretary-General of the United Nations should be prepared to disseminate it immediately and effectively**.	Art 5 of the MA is using the provisions of OST art V and XI. The persons to be informed are not the same: OST: other States Parties, or the UN Secretary General; MA: the Secretary General, the public and the scientific community. The content of the obligation is the same, except that the OST addressed the astronauts and the MA is broader by addressing human life or health, as well as organic life. The MA does not cover outer space. The MA does not require the UN SG to be prepared to disseminate the requested information "immediately and effectively".	Since art 5 of the MA deals with the obligation of information of "their activities concerned with the exploration and use of the Moon" and not those which could create a danger, a specific provision on this type of situation is to be maintained in the future regime. It appears that the OST is more detailed, some of the provisions should be repeated in the case a Party to the MA is not Party to the OST: there is a need to add it is applicable to outer space and the obligation of the Secretary general to disseminate information immediately and effectively.
Freedom of Scientific investigation & cooperation	**Art 6** **1.** There shall be **freedom of scientific investigation** on the Moon by all States Parties		Moon agreement goes further: no discrimination; respect the principle of equality and international law. The MA goes well beyond	The Moon Agreement is relevant and needs to be maintained in the future regime, outer space added.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	without discrimination of any kind, on the basis of **equality** and in accordance with international law	**Art I(3)** There shall be **freedom of scientific investigation** in outer space, including the Moon and other celestial bodies, and States shall facilitate and encourage international cooperation in such investigation.	the OST but remains limited to scientific investigations. Outer space is not mentioned in the MA	
Right to collect and remove samples for scientific investigation	**Art 6** **2**. In carrying out scientific investigations and in furtherance of the provisions of this Agreement, the States Parties shall have the **right to collect on and remove from the Moon samples of its mineral and other substances**. Such samples shall remain **at the disposal** of those States Parties which caused them to be collected and may be used by them for scientific purposes. States Parties shall **have regard to the desirability of making a portion of such samples available to other interested States Parties and the international scientific community for scientific investigation**. States Parties may in the course of scientific investigations also **use mineral and other substances of the Moon in quantities appropriate for the support of their missions**.		This provision is the transformation into legal norms of practices on the moon conducted by the USSR and the US so far. It add details to the freedom of scientific investigation and provides clear elements on what is permitted: Rights to collect and remove samples, not "exploit" Minerals an other substances Make the sample available for interested States Parties and the international scientific community Possibility to exchange personnel Right to use the minerals and other substances for the support of their mission.	The Moon Agreement provisions are the minimum acceptable for the space natural resources scientific investigation. Importance to maintain the provisions of the MA in future regime. As long as there is no international regime in place as foreseen by article 11, art 6(2) shall apply for the use of the samples. The new text will need to keep a clear distinction between the collection and removal of resources for scientific investigation and those for pure commercial purpose.
Inspection	**Article 15** 1. Each State Party may assure itself that the activities of other States Parties in the exploration and use of the Moon are	**Art XII** All stations, installations, equipment and space vehicles on the Moon and other celestial bodies shall be open to	The MA goes beyond by providing the possibility to exchange scientific and other personnel	This provision needs to be maintained.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	compatible with the provisions of this Agreement. To this end, all space vehicles, equipment, facilities, stations and installations on the Moon shall be open to other States Parties. Such States Parties shall give reasonable advance notice of a projected visit **Art 6** 3. States Parties agree on the desirability of **exchanging scientific and other personnel** on expeditions to or installations on the Moon to the greatest extent feasible and practicable.	representatives of other States Parties to the Treaty on a basis of reciprocity. Such representatives shall give reasonable advance notice of a projected visit, in order that appropriate consultations may be held and that maximum precautions may be taken to assure safety and to avoid interference with normal operations in the facility to be visited.		
Non contamination	**Art 7** 1. In exploring and using the Moon, States Parties shall take measures to **prevent the disruption of the existing balance of its environment**, whether by introducing adverse changes in that environment, by its harmful contamination through the introduction of extra-environmental matter or otherwise. States Parties shall also take measures to avoid harmfully affecting the environment of the Earth through the introduction of extraterrestrial matter or otherwise.	**Art IX** (…) States Parties to the Treaty shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to **avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary**, shall adopt appropriate measures for this purpose. (…)	Mirror provisions. This is a fundamental provision for the natural resources. It adds the prohibiting to disrupt the existing environmental balances. MA art 7 subject of an understanding in 1979 in the Committee report §65: "the Committee agreed that article 7 is not intended to result in prohibiting the exploitation of natural resources which may be found on celestial bodies other than the earth, but, rather, that such exploitation will be carried out in such a manner as to minimize any disruption or adverse effects to the existing balance of the environment".	Non-contamination in an international environment must be subject of precise rules. When the rules on SNR exploitation will be elaborated, strict and precise provisions on the respect of the environment will be included, as it is the case in other international areas This provision needs to be maintained.
Obligation of information	**Art 7** 2. States Parties shall inform	No equivalent provision		This provision needs to be maintained.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
related to the moon environment and radioactive materials	the Secretary-General of the United Nations of the measures being adopted by them **in accordance with paragraph 1 of this article and shall also, to the maximum extent feasible, notify him in advance of all placements by them of radioactive materials on the Moon and of the purposes of such placements.**			
International Scientific preservers	**Art 7** 3. States Parties shall report to other States Parties and to the Secretary-General concerning **areas of the Moon having special scientific interest** in order that, without prejudice to the rights of other States Parties, consideration may be given to the designation of such areas as **international scientific preserves** for which special protective arrangements are to be agreed upon in consultation with the competent bodies of the United Nations.	No equivalent clause	This is an additional obligation of crucial importance. It raises the fact that some areas of the Moon will require a specific regime.	This provision is to be maintained in the future regime on natural resources. It could also be used for celestial bodies.
Freedom of exploration and use **Installations and equipments**	**Art 8** 1. States Parties may pursue their activities in the exploration and use of the Moon **anywhere on or below its surface,** subject to the provisions of this Agreement.	**Art I (2)** Outer space, including the Moon and other celestial bodies, shall be **free for exploration and use** by all States without discrimination of any kind, on a basis of equality	The MA is more specific as it provides examples of activities which can be conducted: "(a) Land their space objects on the Moon and launch them from the Moon; (b) Place their personnel, space vehicles, equipment, facilities, stations and installations	Provision to be maintained and extended to the other celestial bodies.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	2. For these purposes States Parties may, in particular: (a) **Land** their space objects on the Moon and launch them from the Moon; (b) **Place** their personnel, space vehicles, equipment, facilities, stations and installations anywhere on or below the surface of the Moon. Personnel, space vehicles, equipment, facilities, stations and installations may move or be moved freely over or below the surface of the Moon.	and in accordance with international law, and there shall be free access to all areas of celestial bodies	anywhere on or below the surface of the Moon. Personnel, space vehicles, equipment, facilities, stations and installations may move or be moved freely over or below the surface of the Moon." This is the first time that the launch from the moon is mentioned. Large principle of freedom - explore and use - is required for the resources, based on the wording of the Moon Agreement.	
Interference and consultations	**Art 8** **3**. Activities of States Parties in accordance with paragraphs 1 and 2 of this article shall **not interfere with the activities of other States Parties** on the Moon. Where such interference may occur, the States Parties concerned shall undertake **consultations** in accordance with article 15, paragraphs 2 and 3, of this Agreement.	**Art IX** If a State Party to the Treaty has reason to believe that an **activity or experiment planned by it or its nationals** (…) **would cause potentially harmful interference with activities of other States Parties** (…), it shall undertake appropriate **international consultations** (…) **Art XIII** Related to questions in connection with activities carried on by international intergovernmental organizations.	Would the consultation not lead to a solution, Parties will have to deal with UN 1970 Declaration Concerning Friendly Relations.	Provision to be maintained in the future regime.
Obligation of information on the stations on the moon	**Art 9** 1. States Parties may establish manned and unmanned **stations on the Moon**. A State Party establishing a	No equivalent clause	Specific provision dedicated to the stations on the moon. Extension of art I and XI of the OST but also of art IV of the Registration Convention	Provision to be maintained in the future regime.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	station shall use only that area which is required for the needs of the station and shall immediately **inform the Secretary-General** of the United Nations of the location and purposes of that station. Subsequently, at annual intervals that State shall likewise inform the Secretary-General whether the station continues in use and whether its purposes have changed.			
Freedom of access	**Art 9** 2. Stations shall be installed in such a manner that they **do not impede the free access to all areas of the Moon of personnel,** vehicles and equipment of other States Parties conducting activities on the Moon in accordance with the provisions of this Agreement or of article I of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.	**Art X** Outer space, including the Moon and other celestial bodies, **shall be free for exploration and use** by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.	State Parties have the choice to comply with the OST or the MA. MA art 9(2) adds specific provisions. It contains a reference to OST art 1.	Provision to be maintained in the future regime.
Life and health of persons on the	**Art 10** 1. States Parties shall adopt all **practicable measures to**	**Art V Rescue Agreement** States Parties to the Treaty shall regard astronauts as	The MA is an extension of the Rescue Agreement.	Provision to be maintained in the future regime.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
Moon	**safeguard the life and health of persons on the Moon**. For this purpose they shall regard any person on the Moon as an astronaut within the meaning of article V of the [OST] (…) and as part of the personnel of a spacecraft within the meaning of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space. 2. States Parties **shall offer shelter in their stations, installations, vehicles and other facilities to persons in distress on the Moon.**	envoys of mankind in outer space and shall render to them all possible assistance in the event of accident, distress, or emergency landing on the territory of another State Party or on the high seas. When astronauts make such a landing, they shall be safely and promptly returned to the State of registry of their space vehicle. In carrying on activities in outer space and on celestial bodies, the astronauts of one State Party shall render all possible assistance to the astronauts of other States Parties. States Parties to the Treaty shall immediately inform the other States Parties to the Treaty or the Secretary-General of the United Nations of any phenomena they discover in outer space, including the Moon and other celestial bodies, which could constitute a danger to the life or health of astronauts.	The purpose is to provide the minimum of provisions to the MA States Parties in the case they have not ratified the Rescue Convention nor the OST.	
Common Heritage if mankind	**Art 11** 1. The Moon and its natural resources are the **common heritage of mankind**, which finds its expression in the provisions of this Agreement, in particular in paragraph 5 of this article.	No equivalent clause	No common heritage of mankind principle in the OST but the province of all mankind. The common heritage of mankind is not a brake to the further exploitation of SNR. It is a political principle encouraging a certain behavior of States, in the spirit of international space law, and not binding at this stage. Such principle does not prevent commercial	Provision to be maintained in the future regime but clearly adapted, taking into account the experience of the common but differentiated responsibility principle

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
			activities to take place, and would not prevent the exploitation. As a consequence, nothing justifies it could be.	
Non-appropriation	**Art 11** 2. The Moon **is not subject to national appropriation** by any claim of sovereignty, by means of use or occupation, or by any other means.	**Art II** 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.	Mirror provision. The protective provisions of the Moon Agreement are a major element of the future regime on space exploration. The same article foresee the establishment of an international regime for the resources exploitation while preventing from any appropriation at the same time The co-existence of a non-appropriation principle and rules on the SNR exploitation is not contradictory. It is even a requirement to secure the future use of outer space, and the development of its resources exploitation. Legal mechanisms – as in other international areas – need to be put into place.	Provision to be maintained in the future regime.
Conditions linked to the prohibition against property	**Art 11** 3. Neither the surface nor the subsurface of the Moon, nor any part 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. The placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface of the Moon,	No equivalent clause	The MA goes further compared to the OST by providing more details on the non-appropriation principles on the moon and other celestial bodies The last sentence stresses that those actions are "without prejudice to the international regime" referred in art 11(5). The prohibition against property applies to natural resources in place on the Moon but not to those which have been removed, a provision related to Art 6 (2) concerning scientific investigation.	This provision has to be kept and is applicable to space natural resources, except those removed for scientific investigation and subject of the respect of art 6(2). Those resources remain at the disposal of the States.

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	including structures connected with its surface or subsurface, **shall not create a right of ownership** over the surface or the subsurface of the Moon or any areas thereof. The foregoing provisions are without prejudice to the international regime referred to in paragraph 5 of this article.			
Respect of international law	**Art 11** 4. States Parties have the right to exploration and use of the Moon without discrimination of any kind, on the basis of equality and in accordance with international law and the terms of this Agreement.	**Art 1** 2. Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.	Mirror provisions	Provision to be maintained in the future regime.
International regime on the resources	**Art 11** 5. States Parties to this Agreement hereby **undertake to establish an international regime**, including appropriate procedures, to govern the exploitation of the natural resources of the Moon **as such exploitation is about to become feasible**. This provision shall be implemented in accordance with article 18 of this Agreement.	No equivalent clause	Major provision of the MA. The international regime will be only on space natural resources. Other agreements are possible as seen in MA art 4(2). The scope of the agreement would be broad: moon and other celestial bodies There is no definition of SNR in the art 11(5) Until the regime is put in place, there is no moratorium on the resources (see the context of the negotiations).	Space natural resources are considered as mineral and other substances. In the new text, this provision will disappear and be replaced by provisions related to the resources exploitation.
Obligation of information	**Art 11** 6. **In order to facilitate the**	No equivalent clause	The provision does not foresee any delay for the	This provision remains relevant in the

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
on the natural resources	**establishment of the international regime** referred to in paragraph 5 of this article, States Parties shall **inform the Secretary- General** of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, **of any natural resources** they may discover on the Moon.		notification to the UN regarding the celestial bodies. Several resources have already been discovered on the moon. Occasion existed where States Parties could inform about the resources but it was not done for political reasons .	future regime.
Content of the international regime	**Art 11** 7. **The main purposes of the international regime to be established shall include**: (a) The orderly and safe development of the natural resources of the Moon; (b) The rational management of those resources; (c) The expansion of opportunities in the use of those resources; (d) **An equitable sharing** by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon, shall be given special consideration.	No equivalent clause	(d) is line with OST art I and adds that special consideration shall be given developing countries (which are not defined) and countries contributing "directly or indirectly to the exploration of the Moon". Issue with definition of the developing countries, direct contributions and indirect contributions. The Senate Foreign Relations Committee in reporting on the 1967 OST, stated the Committee's understanding that "nothing in art I(1) of the Treaty diminishes or alters the right of the US to determine how it shares the benefits and results of the space activities (Senate Executive Report N°8, 90th Congress, 1st session. April 18, 1967, p.4. "Treaty on Outer Space"). One solution proposed by Mrs Galloway is that sharing would be in accordance with the degree of a State Party's contribution to a project.	There is a need to define a regime on the resources, the benefits coming from the resources and the question of sharing. This provision will disappear and be replaced by the international regime itself with adaptations to art 7 requirements.
Respect the right to collect	**Art 11** 8. All the activities with respect	No equivalent clause	Reference is made to art 7 and 6.2 both dealing	The future regime will maintain the

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
and remove samples	to the natural resources of the Moon **shall be carried out in a manner compatible with the purposes specified in paragraph 7 of this article and the provisions of article 6, paragraph 2**, of this Agreement.		with natural resources For Mrs Galloway, this paragraph is is an evidence that pending the creation of an international regime various activities are permitted in exploring and using the natural resources of the Moon.	right to collect and remove samples while defining a dedicated regime on resources exploitation.
Jurisdiction and control	**Art 12** 1. States Parties shall retain jurisdiction and control over their personnel, vehicles, equipment, facilities, stations and installations on the Moon. The ownership of space vehicles, equipment, facilities, stations and installations shall not be affected by their presence on the Moon.	**Art VIII** A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. (…)	The MA recalls fundamental OST principles It adds that ownership of vehicles, equipment, facilities, stations and installations shall not be affected by their presence on the Moon.	Provision to be maintained in the future regime.
Obligation of information	**Art 12** 2. Vehicles, installations and equipment or their component parts found in places other than their intended location shall be dealt with in accordance with article 5 of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space.	No equivalent clause	New element compared to the OST. Need to respect art 5 of the MA related to the Astronaut Convention.	Provision to be maintained in the future regime.
Emergency situation and obligation of information	**Art 12** 3. In the event of an emergency involving a threat to human life, States Parties may **use the equipment, vehicles,**	**Article V** States Parties to the Treaty shall regard astronauts as envoys of mankind in outer space and shall render to them all possible assistance in the	Additional specific clause for the MA in cause of emergency The MA goes further as States Parties can take an initiative without waiting assistance	Provision to be maintained in the future regime.

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Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	installations, facilities or supplies of other States Parties on the Moon. Prompt notification of such use shall be made to the Secretary-General of the United Nations or the State Party concerned.	event of accident, distress, or emergency landing on the territory of another State Party or on the high seas. When astronauts make such a landing, they shall be safely and promptly returned to the State of registry of their space vehicle.		
Obligation to provide assistance	**Art 13** A State Party which learns of the crash landing, forced landing or other unintended landing on the Moon of a space object, or its component parts, that were not launched by it, shall promptly inform the launching State Party and the Secretary-General of the United Nations.	In carrying on activities in outer space and on celestial bodies, the astronauts of one State Party shall render all possible assistance to the astronauts of other States Parties. States Parties to the Treaty shall immediately inform the other States Parties to the Treaty or the Secretary-General of the United Nations of any phenomena they discover in outer space, including the Moon and other celestial bodies, which could constitute a danger to the life or health of astronauts.	The MA goes further in terms of obligation of information.	Provision to be maintained in the future regime.
International responsibility	**Art 14** **1**. States Parties to this Agreement shall bear international responsibility for national activities on **the Moon**, whether such activities are carried on **by governmental agencies or by non-governmental entities**, and for assuring that national activities are carried out in	**Article VI** States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national	Mirror provision. The MA calls for activities to be carried out in conformity with its provisions whereas OST provides for conformity to its own provisions. The MA omits outer space as an area. This same point applies to the required authorization and continuing supervision by States Parties of non-governmental entities. The MA does not contain specific clause on	States responsibility is to be maintained. As a fundamental principle, the wording of the Moon Agreement shall be maintained. It is necessary to introduce outer space and the moon for the States Parties which would not be Party to the OST. Need a mirror provision on international organizations.

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Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	conformity with the provisions set forth in this Agreement. States Parties shall ensure that non-governmental entities under their jurisdiction shall engage in activities on the **Moon** only under the authority and continuing supervision of the appropriate State Party.	activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.	international organizations.	
International Liability	**Art 14** **2**. States Parties recognize that **detailed arrangements concerning liability for damage caused on the Moon**, in addition to the provisions of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies and the Convention on International Liability for Damage Caused by Space Objects, **may become necessary as a result of more**	**Art VII** Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is **internationally liable** for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space,	The MA goes further by providing the possibility to set up separate arrangements in addition to the OST for damages enhanced by activities on the moon. In such case, the elaboration shall be made when the Agreement is reviewed in accordance with the MA art 18.	Need to maintain this provision as future activities on the moon will probably make art 14(1) and 2 needed.

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Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	extensive activities on the Moon. Any such arrangements shall be elaborated in accordance with the procedure provided for in article 18 of this Agreement.	including the Moon and other celestial bodies.		
Activities compatibles with the Moon Agreement	**Art 15** 1. Each State Party may assure itself that the **activities** of other States Parties in the exploration and use of the Moon are **compatible with the provisions of this Agreement**. To this end, all space vehicles, equipment, facilities, stations and installations on the Moon shall be **open** to other States Parties. Such States Parties shall give reasonable advance notice of a projected visit, in order that appropriate consultations may be held and that maximum precautions may be taken to assure safety and to avoid interference with normal operations in the facility to be visited. In pursuance of this article, any State Party may act on its own behalf or with the full or partial assistance of any other State Party or through appropriate international procedures within the framework of the United Nations and in accordance with the Charter.	**Art XIII** The provisions of this Treaty shall apply to the activities of States Parties to the Treaty in the exploration and use of outer space, including the Moon and other celestial bodies, whether such activities are carried on by a single State Party to the Treaty or jointly with other States, including cases where they are carried on within the framework of international intergovernmental organizations.	Similar to art XIII of the OST. Adds that States Parties may act alone The notion of reciprocity is not in the MA. This is another instance of where the handling of events could vary according to whether a State were Party to both treaties or only OST or the MA.	Provision to be maintained in the future regime.

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Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
Consultations	**Art 15** 2. A State Party which has reason to believe that another State Party is not fulfilling the obligations incumbent upon it pursuant to this Agreement or that another State Party is interfering with the rights which the former State has under this Agreement may **request consultations** with that State Party. A State Party receiving such a request shall enter into such consultations without delay. Any other State Party which requests to do so shall be entitled to take part in the consultations. **Each State Party participating in such consultations shall seek a mutually acceptable resolution of any controversy** and shall bear in mind the rights and interests of all States Parties. The Secretary-General of the United Nations shall be informed of the results of the consultations and shall transmit the information received to all States Parties concerned.	**Art IX** In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance and shall conduct all their activities in outer space, including the Moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty. (…)	The MA goes a bit further.	Provision to be maintained in the future regime.
Settlement of disputes	**Art 15** 3. If the consultations do not lead to a mutually acceptable settlement which has due regard for the rights	No similar clause	The MA adds detailed measures. The Declaration o Friendly Relations in art 2 may be cited for the variety of ways for settling	Need for a solid settlement of dispute mechanism.

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Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	and interests of all States Parties, the parties concerned **shall take all measures to settle the dispute by other peaceful means of their choice** appropriate to the circumstances and the nature of the dispute. If difficulties arise in connection with the opening of consultations or if consultations do not lead to a mutually acceptable settlement, any State Party may seek the assistance of the Secretary-General, without seeking the consent of any other State Party concerned, in order to resolve the controversy. A State Party which does not maintain diplomatic relations with another State Party concerned shall participate in such consultations, at its choice, either itself or through another State Party or the Secretary-General as intermediary.		in disputes.	
International organizations	**Art 16** With the exception of articles 17 to 21, **references in this Agreement to States shall be deemed to apply to any international intergovernmental organization** which conducts space activities if the organization **declares its acceptance** of the rights and obligations provided for in this		Organizations are bound by the agreement , but it requires that a majority of its member States are also parties to the OST and we know today it is not the case. It ensures a good coordination with OST but raises the problems linked to the fact that the MA has not been ratified by the same countries as the OST.	There is no interest to keep it as long as few countries have ratified the MA.

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Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	Agreement and **if a majority of the States members of the organization are States Parties to this Agreement** and to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. States members of any such organization which are States Parties to this Agreement shall take all appropriate steps to ensure that the organization makes a declaration in accordance with the foregoing.			
Amendment	**Art 17** Any State Party to this Agreement may propose amendments to the Agreement. Amendments shall enter into force for each State Party to the Agreement accepting the amendments upon their acceptance by a majority of the States Parties to the Agreement and thereafter for each remaining State Party to the Agreement on the date of acceptance by it.	**Art XV** Any State Party to the Treaty may propose amendments to this Treaty. Amendments shall enter into force for each State Party to the Treaty accepting the amendments upon their acceptance by a majority of the States Parties to the Treaty and thereafter for each remaining State Party to the Treaty on the date of acceptance by it.	Mirror provision on amendment.	Provision to be maintained in the future regime.
Review	**Art 18** **Ten years after the entry into force** of this Agreement, the question of the **review** of the Agreement shall be included in the provisional		Not in the OST and never applied for the MA Not even on art 11(5).	Need to maintain in the future regime a provision related to the review of the treaty, but the provisions on art 11(5) shall be removed since the new draft objective is to define a the regime on

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	agenda of the General Assembly of the United Nations in order to consider, in the light of past application of the Agreement, whether it requires revision. However, at any time after the Agreement has been in force for five years, the Secretary-General of the United Nations, as depositary, shall, at the request of one third of the States Parties to the Agreement and with the concurrence of the majority of the States Parties, convene a conference of the States Parties to review this Agreement. **A review conference shall also consider the question of the implementation of the provisions of article 11, paragraph 5,** on the basis of the principle referred to in paragraph 1 of that article and taking into account in particular any relevant technological developments.			resources exploitation.
Entry into force	**Art 19** 1. This Agreement shall be **open for signature** by all States at United Nations Headquarters in New York. 2. This Agreement shall be **subject to ratification by signatory States**. Any State which does not sign this Agreement before its entry into force in accordance with	**Art XIV** 1. This Treaty shall be open to all States for signature. Any State which does not sign this Treaty before its entry into force in accordance with paragraph 3 of this article may accede to it **at any time**. 2. This Treaty shall be subject to ratification by signatory States. Instruments of	Mirror provisions. OST required ratification by 5 States, incl. the depositary governments, the US, USSR, and the UK, whereas the MA can go into force 30 days after any 5 States deposit their ratifications with the UNSG.	The provision remains applicable for the governments not State Parties, until a new text is adopted

Appendix III Outer Space Treaty and Moon Agreement Comparative analysis Table

Key Topics	1979 Moon Agreement (MA)	1967 Outer Space Treaty (OST)	Comparative Analysis	Proposal
	paragraph 3 of this article may accede to it **at any time**. Instruments of ratification or accession shall be deposited with the Secretary-General of the United Nations. 3. This Agreement shall **enter into force on the thirtieth day following the date of deposit of the fifth instrument of ratification.** 4. For each State depositing its instrument of ratification or accession after the entry into force of this Agreement, it shall enter into force on the thirtieth day following the date of deposit of any such instrument. 5. The Secretary-General shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification or accession to this Agreement, the date of its entry into force and other notices.	ratification and instruments of accession shall be deposited with the Governments of the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America, which are hereby designated the Depositary Governments. 3. This Treaty shall enter into force upon the deposit of instruments of ratification by five Governments including the Governments designated as Depositary Governments under this Treaty. 4. For States whose instruments of ratification or accession are deposited subsequent to the entry into force of this Treaty, it shall enter into force on the date of the deposit of their instruments of ratification or accession. (…).		

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/ 1979 Moon Agreement**
Peaceful purposes	Treaty Art I. Peaceful purposes. Antarctica shall be used for peaceful purposes only.	Preamble: the convention is considered as an important contribution to the maintenance of peace, justice and progress for all people of the world Art 88. Reservation of the high seas for peaceful purposes. Art 141. Use of the Area exclusively for peaceful purposes. Art 301. Peaceful uses of the seas. (…) States Parties shall refrain from any threat or use of force against the territorial integrity or political independence of any State (…)	Art IV OST/art 3MA **Commonalities. MA contains stronger provisions**
Military activities	Treaty Art I. (...).Peaceful purposes. There shall be prohibited, inter alia, any measure of a military nature, such as the establishment of military bases and fortifications, the carrying out of military manoeuvres, as well as the testing of any type of weapon. The present Treaty shall not prevent the use of military personnel or equipment for scientific research or for any other peaceful purpose	Specific rules for warships and military aircrafts	Art IV OST/art 3MA **Commonalities. MA contains stronger provisions**
Nuclear activity	Treaty Art V Nuclear activity Any nuclear explosions in Antarctica and the disposal there of radioactive waste material shall be prohibited	Art 22-23 Provisions on nuclear-power ships and ships carrying nuclear or other inherently dangerous or noxious substances	Art IV OST/art 3 MA **Differences. Prohibitions do not address exactly the same activities. Moon and OST only refer to nuclear weapons.**
Respect of international law	Treaty Art V Activity contrary to the treaty Each of the Contracting Parties undertakes to exert appropriate efforts, consistent with the Charter of the United Nations, to the end that no one engages in any activity in Antarctica contrary to the principles or purposes of the present Treaty	Throughout the convention: preamble, art 2 (general provisions), for all areas: art 19, 20, 31, 34, 39, 58, 74, 83, 87 (high sea), 138 (the Area), 139, 146, 160 (The Assembly), 221 (protection of marine environment), 223, 235 (responsibility & liability), 293 (applicable law), 295, 297, 301 (general provisions), 303, 304, 317.	Art III OST/art 2MA **Commonalities. Necessity to keep the provision in future legal framework**
Non-appropriation	Treaty Art IV Territorial sovereignty 1. Nothing contained in the present Treaty shall be interpreted as: a. a renunciation by any Contracting Party of previously asserted rights of or claims to territorial sovereignty in Antarctica; b. a renunciation or diminution by any Contracting Party of any basis of claim to territorial sovereignty in Antarctica which it may have whether as a result of its activities	Art 89 Invalidity of claims of sovereignty over the high seas. No State may validly purport to subject any part of the high seas to its sovereignty	Art II OST/art 11(2) MA **Same spirit, provisions treated differently**. **Historical context of the Antarctic is**

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	1959 Antarctica Treaty 1988 CRAMRA (not applicable) 1991 Protocol	UNCLOS 1982 Law and Part XI on the Area	1967 OST/ 1979 Moon Agreement
	or those of its nationals in Antarctica, or otherwise; c. prejudicing the position of any Contracting Party as regards its recognition or non-recognition of any other State,s rights of or claim or basis of claim to territorial sovereignty in Antarctica. 2. No acts or activities taking place while the present Treaty is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctica or create any rights of sovereignty in Antarctica. No new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the present Treaty is in force.		**different. Necessity to keep the fundamental principle of prohibition of sovereignty over the area.**
Freedom of exploration	Art II Freedom of scientific investigation Article III - International scientific cooperation 1. In order to promote international cooperation in scientific investigation in Antarctica, as provided for in Article II of the present Treaty, the Contracting Parties agree that, to the greatest extent feasible and practicable: information regarding plans for scientific programs in Antarctica shall be exchanged to permit maximum economy of and efficiency of operations; b. scientific personnel shall be exchanged in Antarctica between expeditions and stations; c. scientific observations and results from Antarctica shall be exchanged and made freely available.	Art 36 Freedom of navigation and over flight (high seas routes) Art 87 Freedom of the high sea Art 90 Right of navigation	Art I OST/art 4 MA **Commonalities. The spirit behind is the same. Freedom of exploration and use in space. Maintain the principle with the relevant limits for the resources exploitation in future regime.**
Freedom of scientific investigation & research	Treaty Art II Freedom of scientific investigation in Antarctica and cooperation toward that end, (…), shall continue, subject to the provisions of the present Treaty .	Art 87 Freedom of scientific research on the high seas Art 143 States Parties shall promote international cooperation in marine scientific research in the Area Part XIII Maritime scientific research art 238-265 Art 238 Right to conduct marine scientific research Article 240 (...) (a) marine scientific research shall be conducted exclusively for peaceful purposes; (b) marine scientific research shall be conducted with appropriate scientific methods and means compatible with this Convention; (c) marine scientific research shall not unjustifiably interfere with other legitimate uses of the sea compatible with this Convention and shall be duly respected in the course of such uses; (d) marine scientific research shall be conducted in compliance with all relevant regulations adopted in conformity with this Convention including those for the protection and preservation of the marine environment.	Art I(3) OST/art 6 **Commonalities. The MA goes further (no discrimination and respect of the principle of equality).**

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/** **1979 Moon Agreement**
International cooperation	Treaty: Cooperation is treated in the frame of the scientific international cooperation Protocol art 6 Cooperation. 1 The Parties shall cooperate in the planning and conduct of activities in the Antarctic Treaty area. To this end, each Party shall endeavour to: (a) promote cooperative programs of scientific, technical and educational value, concerning the protection of the Antarctic environment and dependent and associated ecosystems; (b) provide appropriate assistance to other Parties in the preparation of environmental impact assessments; (c) provide to other Parties upon request information relevant to any potential environmental risk and assistance to minimise the effects of accidents which may damage the Antarctic environment or dependent and associated ecosystems; (d) consult with other Parties with regard to the choice of sites for prospective station sand other facilities so as to avoid the cumulative impacts caused by their excessive concentration in any location; (e) where appropriate, undertake joint expeditions and share the use of stations and other facilities; and (f) carry out such steps as may be agreed upon at Antarctic Treaty Consultative Meetings. (…) 3 The Parties shall co-operate with those Parties which may exercise jurisdiction in areas adjacent to the Antarctic Treaty area with a view to ensuring that activities in the Antarctic Treaty area do not have adverse environmental impacts on those areas.	Article 138 General conduct of States in relation to the Area in accordance with the Charter of the United Nations and other rules of international law in the interests of maintaining peace and security and promoting international cooperation and mutual understanding Article 150 Policies relating to activities in the Area to foster healthy development of the world economy and balanced growth of international trade, and to promote international cooperation for the over-all development of all countries, especially developing States Part XIII Maritime scientific research Article 242 Promotion of international cooperation Art 243 Creation of favourable conditions	Art III, IX OST/art 4 MA. **Commonalities. MA goes further than the OST. Art 6 of the 1991 Protocol could be interesting for the future regime. Art 4 MA also of interest as providing the possibility to draw additional legal norms.**
Installation & equipment	Art VII Inspections 3. All areas of Antarctica, including all stations, installations and equipment within those areas, and all ships and aircraft at points of discharging or embarking cargoes or personnel in Antarctica, shall be open at all times to inspection by any observers designated in accordance with paragraph 1 of this Article.	Art 258 The deployment and use of any type of scientific research installations or equipment in any area of the marine environment shall be subject to the same conditions as are prescribed in this Convention for the conduct of marine scientific research in any such area.	Art 1(2) OST/art 8 MA **Commonalities. The MA is more detailed.**
Protected areas	Protocol Annex V Possibility to create Antarctic Specially Protected Area (to protect outstanding environmental, scientific, historic, aesthetic or wilderness values, any combination of those values, or ongoing or planned scientific research) or an Antarctic Specially	Part XII Protection and preservation of the marine environment Art 192 States have the obligation to protect and preserve the marine environment	**Art 7 MA Commonalities with the Antarctic Treaty: possibility to create**

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/** **1979 Moon Agreement**
	Managed Area (Any area, including any marine area, where activities are being conducted or may in the future be conducted, may be designated as an Antarctic Specially Managed Area to assist in the planning and co-ordination of activities, avoid possible conflicts, improve co-operation between Parties or minimise environmental impacts). Activities in those Areas shall be prohibited, restricted or managed in accordance with Management Plans adopted under the provisions of this Annex CRAMRA art 13 1. Antarctic mineral resource activities shall be prohibited in any area designated as a Specially Protected Area or a Site of Special Scientific Interest under Article IX(1) of the Antarctic Treaty. Such activities shall also be prohibited in any other area designated as a protected area in accordance with Article IX(1) of the Antarctic Treaty, except to the extent that the relevant measure provides otherwise. Pending any designation becoming effective in accordance with Article IX(4) of the Antarctic Treaty, no Antarctic mineral resource activities shall take place in any such area which would prejudice the purpose for which it was designated. 2. The Commission shall also prohibit or restrict Antarctic mineral resource activities in any area which, for historic, ecological, environmental, scientific or other reasons, it has designated as a protected area.		**international scientific preserves. Need to keep the rule for special areas known today as requiring such regime (eg: the dark side of the Moon) as well as any area discovered in the future requiring such protection?**
Environment & impact and assessment	Protocol art 8 Environmental Impact and Assessment 1 Proposed activities referred to in paragraph 2 below shall be subject to the procedures set out in Annex I for prior assessment of the impacts of those activities on the Antarctic environment or on dependent or associated ecosystems according to whether those activities are identified as having: (a) less than a minor or transitory impact; (b) a minor or transitory impact; or (c) more than a minor or transitory impact. (…) Annex IV to the Protocol on the prevention of marine pollution	Part XII Protection and preservation of the marine environment Art 194. Measure to prevent, reduce and control pollution of the marine environment Art 195 Duty not to transfer damage or hazards or transform one type of pollution into another. In taking measures to prevent, reduce and control pollution of the marine environment, States shall act so as not to transfer, directly or indirectly, damage or hazards from one area to another or transform one type of pollution into another. Section 6 enforcement Art 206 Assessment of potential effects of activities When States have reasonable grounds for believing that	**Art IX OST/art 7 MA Commonalities. However Antarctic and Sea regime provide detailed measures.** **The introduction of impact assessment could be an interesting provision, before**

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/ 1979 Moon Agreement**
		planned activities under their jurisdiction or control may cause substantial pollution of or significant and harmful changes to the marine environment, they shall, as far as practicable, assess the potential effects of such activities on the marine environment and shall communicate reports of the results of such assessments in the manner provided in article 205. Section 5 to rules and national legislation to prevent reduce and control pollution of the environment art 207-212 on all type of pollution	**the activity takes place.**
Inspections	Treaty Art VII Inspections Right to designate observers to carry out any inspection. Each observer shall have complete freedom of access at any time to any or all areas of Antarctica. All areas of Antarctica shall be open at all times to inspection by any observers CRAMRA art 11 *Inspection under the Antarctic Treaty* All stations, installations and equipment, in the Antarctic Treaty area, relating to Antarctic mineral resource activities, as well as ships and aircraft supporting such activities at points of discharging or embarking cargoes or personnel at such stations and installations, shall be open at all times to inspection by observers designated under Article VII of the Antarctic Treaty for the purposes of that Treaty.	Art 220, 226 Physical inspection of vessel is planned.	Art XII OST/art 15 MA **Differences as OST and MA deal with right of visit of Parties representatives, not observers. Could be interesting but hard to implement for practical reasons.**
Jurisdiction	Treaty Art VIII Jurisdiction In order to facilitate the exercise of their functions under the present Treaty, and without prejudice to the respective positions of the Contracting Parties relating to jurisdiction over all other persons in Antarctica, observers designated under paragraph 1 of Article VII and scientific personnel exchanged under sub-paragraph 1(b) of Article III of the Treaty, and members of the staffs accompanying any such persons, shall be subject only to the jurisdiction of the Contracting Party of which they are nationals in respect of all acts or omissions occurring while they are in Antarctica for the purpose of exercising their functions.	Article 92 Status of ships. 1. Ships shall sail under the flag of one State only and, save in exceptional cases expressly provided for in international treaties or in this Convention, shall be subject to its exclusive jurisdiction on the high seas. Article 94 Duties of the flag State. 1. Every State shall effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag	Art VIII OST/art 12MA **Commonalities. Fundamental principle of space law. Need to keep the link with a State Party: jurisdiction and control over the installations and the personnel.**

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/** **1979 Moon Agreement**
Emergency situations & assistance	Protocol art 15 Emergency Response action In order to respond to environmental emergencies in ^ Antarctic Treaty area, each Party agrees to: (a) provide for prompt and effective response action to such emergencies which might arise in the performance of scientific research programs, tourism and all other governmental and non-governmental activities in the Antarctic Treaty area for which advance notice is required under Article VII (5) of the Antarctic Treaty, including associated logistic support activities; and (b) establish contingency plans for response to incidents with potential adverse effects on the Antarctic environment or dependent and associated ecosystems. 2 To this end, the Parties shall: (a) co-operate in the formulation and implementation of such contingency plans; and (b) establish procedures for immediate notification of, and co-operative response to, environmental emergencies. 3 In the implementation of this Article, the Parties shall draw upon the advice of the appropriate international organisations.	Article 98 Duty to render assistance 1. Every State shall require the master of a ship flying its flag, in so far as he can do so without serious danger to the ship, the crew or the passengers: (a) to render assistance to any person found at sea in danger of being lost; (b) to proceed with all possible speed to the rescue of persons in distress, if informed of their need of assistance, in so far as such action may reasonably be expected of him; (c) after a collision, to render assistance to the other ship, its crew and its passengers and, where possible, to inform the other ship of the name of his own ship, its port of registry and the nearest port at which it will call. 2. Every coastal State shall promote the establishment, operation and maintenance of an adequate and effective search and rescue service regarding safety on and over the sea and, where circumstances so require, by way of mutual regional arrangements cooperate with neighbouring States for this purpose	Art V OST/art 10,12, 13 MA also art V Rescue Agreement **Commonalities. Fundamental principle to be maintained in the future regime.**
Meetings	Treaty art IX Treaty meetings (…) for the purpose of exchanging information, consulting together on matters of common interest pertaining to Antarctica, and formulating and considering, and recommending to their Governments, measures in furtherance of the principles and objectives of the Treaty, including measures regarding: a. use of Antarctica for peaceful purposes only; b. facilitation of scientific research in Antarctica; c. facilitation of international scientific cooperation in Antarctica; d. facilitation of the exercise of the rights of inspection provided for in Article VII of the Treaty; e. questions relating to the exercise of jurisdiction in Antarctica; f. preservation and conservation of living resources in Antarctica. Protocol art 10 Antarctic Treaty Consultative Meetings Protocol art 11 Committee for Environmental protection	No equivalent measures	Art IX OST/ art 15 MA only provides for a consultation mechanism **Differences. No similar formalised body Particularity of the Antarctic Treaty.**
Modification & duration	Protocol art 25 Modification or Amendment 2. If, after the expiration of 50 years from the date of entry into force of this Protocol, any of the Antarctic Treaty Consultative Parties so requests by a communication addressed to the Depositary, a conference shall be held as soon as practicable to review the operation of this Protocol.	Art 312 Amendment. After the expiry of a period of 10 years from the date of entry into force of this Convention, a State Party may, by written communication addressed to the Secretary-General of the United Nations, propose specific amendments to this Convention, other than those relating to activities in the Area	**Not in the OST/Art 18 MA Differences. Duration issue is fundamental (see resources below)**

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/ 1979 Moon Agreement**
International responsibility and liability	Treaty: no dedicated provision Protocol art 16 Liability Consistent with the objectives of this Protocol for the comprehensive protection of the Antarctic environment and dependent and associated ecosystems, the Parties undertake to elaborate rules and procedures relating to liability for damage arising from activities taking place in the Antarctic Treaty area and covered by this Protocol. Those rules and procedures shall be included in one or more Annexes to be adopted in accordance with Article 9 (2). See also Annex VI to the Protocol on environmental protection to the Antarctic Treaty.	Part XII Protection and preservation of the marine environment Art 235 Responsibility and liability 1. States are responsible for the fulfilment of their international obligations concerning the protection and preservation of the marine environment. They shall be liable in accordance with international law. 2. States shall ensure that recourse is available in accordance with their legal systems for prompt and adequate compensation or other relief in respect of damage caused by pollution of the marine environment by natural or juridical persons under their jurisdiction. 3. With the objective of assuring prompt and adequate compensation in respect of all damage caused by pollution of the marine environment, States shall cooperate in the implementation of existing international law and the further development of international law relating to responsibility and liability for the assessment of and compensation for damage and the settlement of related disputes, as well as, where appropriate, development of criteria and procedures for payment of adequate compensation, such as compulsory insurance or compensation funds. Part XIII Marine scientific research Article 263 Responsibility and liability 1. States and competent international organizations shall be responsible for ensuring that marine scientific research, whether undertaken by them or on their behalf, is conducted in accordance with this Convention. 2. States and competent international organizations shall be responsible and liable for the measures they take in contravention of this Convention in respect of marine scientific research conducted by other States, their natural or juridical persons or by competent international organizations, and shall provide compensation for damage resulting from such measures. (…)	Art VI, VII OST/art 14 MA **Commonalities on the principle of a State responsibility need to be maintained in future regime.**
Settlement of dispute	Treaty Art XI Disputes between parties 1. If any dispute arises between two or more of the Contracting Parties concerning the interpretation or application of the present Treaty, those Contracting Parties shall consult among themselves with a view to having the dispute resolved by negotiation, inquiry, mediation, conciliation, arbitration, judicial	Part XV Settlement of disputes Art 279-299 Art 279 Obligation to settle disputes by peaceful means States Parties shall settle any dispute between them concerning the interpretation or application of this Convention by peaceful means in accordance with Article 2, paragraph 3, of the Charter of the United Nations and, to this end, shall seek a solution by	**Not in the OST/art 15 MA. Differences. Reference in the MA to the 1970 UN Declaration of**

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/** **1979 Moon Agreement**
	settlement or other peaceful means of their own choice. 2. Any dispute of this character not so resolved shall, with the consent, in each case, of all parties to the dispute, be referred to the International Court of Justice for settlement; but failure to reach agreement on reference to the International Court shall not absolve parties to the dispute from the responsibility of continuing to seek to resolve it by any of the various peaceful means referred to in paragraph 1 of this Article. Protocol art 18 If a dispute arises concerning the interpretation or application of this Protocol, the parties to the dispute shall, at the request of any one of them, consult among themselves as soon as possible with a view to having the dispute resolved by negotiation, inquiry, mediation, conciliation, arbitration, judicial settlement or other . which the parties to the dispute agree. Protocol art 19 Choice of Dispute settlement procedure Protocol art 20 Dispute settling procedure CRAMRA Art 56 choice of procedure: the International Court of Justice or the Arbitral Tribunal	the means indicated in Article 33, paragraph 1, of the Charter. Article 287 Choice of procedure 1. When signing, ratifying or acceding to this Convention or at any time thereafter, a State shall be free to choose, by means of a written declaration, one or more of the following means for the settlement of disputes concerning the interpretation or application of this Convention: (a) the International Tribunal for the Law of the Sea established in accordance with Annex VI; (b) the International Court of Justice; (c) an arbitral tribunal constituted in accordance with Annex VII; (d) a special arbitral tribunal constituted in accordance with Annex VIII for one or more of the categories of disputes specified therein. PartXI art 86 Art 186 The Seabed Disputes Chamber of the International Tribunal for the Law of the Sea	**Friendly relations could be reinforced with a reference to the ICJ**
Obligation/disclosure of information	Treaty Art III 1. In order to promote international cooperation in scientific investigation in Antarctica, as provided for in Article II of the present Treaty, the Contracting Parties agree that, to the greatest extent feasible and practicable: a. information regarding plans for scientific programs in Antarctica shall be exchanged to permit maximum economy of and efficiency of operations; b. scientific personnel shall be exchanged in Antarctica between expeditions and stations; c. scientific observations and results from Antarctica shall be exchanged and made freely available Protocol art 6 Cooperation §2. 2 Each Party undertakes, to the extent possible, to share information that may be helpful to other Parties in planning and conducting their activities in the Antarctic Treaty area, with a view to the protection of the Antarctic environment and dependent and associated ecosystems. CRAMRA art 16	Part XIII Maritime scientific research Art 244 Publication and dissemination of information and knowledge Article 302 Disclosure of information Without prejudice to the right of a State Party to resort to the procedures for the settlement of disputes provided for in this Convention, nothing in this Convention shall be deemed to require a State Party, in the fulfilment of its obligations under this Convention, to supply information the disclosure of which is contrary to the essential interests of its security.	**Commonalities. Several provisions in Art IX, XI OST/art 5, 7, 9, 12 MA while the MA contain specific provisions for the Moon. Necessary to maintained detailed mechanism on the obligation of information**

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/** **1979 Moon Agreement**
	Availability and Confidentiality of Data and Information Data and information obtained from Antarctic mineral resource activities shall, to the greatest extent practicable and feasible, be made freely available, provided that: a as regards data and information of commercial value deriving from prospecting, they may be retained by the Operator in accordance with Article 37; b regards data and information deriving from exploration or development, the Commission shall adopt measures relating, as appropriate, to their release and to ensure the confidentiality of data and information of commercial value.		
Peaceful purposes	Antarctic Treaty, CRAMRA, Protocol preambles It is in the interest of all mankind that Antarctica shall continue for ever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord	Article 141 Use of the Area exclusively for peaceful purposes The Area shall be open to use exclusively for peaceful purposes by all States, whether coastal or land-locked, without discrimination and without prejudice to the other provisions of this Part. Art 143 Marine scientific research in the Area shall be carried out exclusively for peaceful purposes and for the benefit of mankind as a whole, in accordance with Part XIII. (…)	**Fundamental provision to be maintained in the future regime.**
Definitions	CRAMRA Art 1 6. 'Mineral resources' means all non-living natural non-renewable resources, including fossil fuels, metallic and non-metallic minerals. 7. 'Antarctic mineral resource activities' means prospecting, exploration or development, but does not include scientific research activities within the meaning of Article III of the Antarctic Treaty.	Article 133 Use of terms For the purposes of this Part: (a) "resources" means all solid, liquid or gaseous mineral resources in situ in the Area at or beneath the seabed, including polymetallic nodules; (b) resources, when recovered from the Area, are referred to as "minerals".	**Commonalities. Art 6 MA defines the resources as "mineral or other substance".**
Activity related to the resources	Protocol art 7 Prohibition of mineral resources activities Any activity relating to mineral resources, other than scientific research, shall be prohibited. Protocol art 25 provides a duration of 50 years for the Protocol starting 1998, so 2048. As for the mineral resources, it is agreed that "the prohibition on Antarctica mineral resource activities contained therein shall continue unless there is in force a binding legal regime on Antarctica (…) CRAMRA art 3 Prohibition of Antarctic Mineral resource activities outside the Convention CRAMRA art 4 (…)No Antarctic mineral resource activity shall	Law of the sea: distinction based on the area Part VI Continental shelf Art 77 The Coastal State has sovereign rights on exploitation and exploration of the continental shelf natural resources Part VII High seas Art 116-120 Conservation and management of the living resources - right to fish on the high seas; cooperation of States in the conservation and management of living resources Part XIII Protection and preservation of the marine environment Art 192 sovereign right of States to exploit their natural	**No dedicated provision yet.** **In the meantime art 6 MA: right to collect and remove samples.** **Need for a distinction between the removal and collection of the resources for the need of the mission**

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/** **1979 Moon Agreement**
	take place until it is judged, based upon assessment of its possible impacts on the Antarctic environment and on dependent and on associated ecosystems (…)	resources and the protection of the environment Art 193 sovereign rights to exploit their natural resources and protection of the environment	**and a commercial exploitation**.
No sovereignty	CRAMRA art 9 Protection of Legal Positions under the Antarctic Treaty Nothing in this Convention and no acts or activities taking place while this Convention is in force shall: a) constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in the Antarctic Treaty area or create any rights of sovereignty in the Antarctic Treaty area; b) be interpreted as a renunciation or diminution by any Party of, or as prejudicing, any right or claim or basis of claim to territorial sovereignty in Antarctica or to exercise coastal state jurisdiction under international law; c) be interpreted as prejudicing the position of any Party as regards its recognition or non-recognition of any such right, claim or basis of claim; or d) affect the provision of Article IV(2) of the Antarctic Treaty that no new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the Antarctic Treaty is in force.	Article 137 Legal status of the Area and its resources 1. No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof. No such claim or exercise of sovereignty or sovereign rights nor such appropriation shall be recognized. 2. All rights in the resources of the Area are vested in mankind as a whole, on whose behalf the Authority shall act. These resources are not subject to alienation. The minerals recovered from the Area, however, may only be alienated in accordance with this Part and the rules, regulations and procedures of the Authority. 3. No State or natural or juridical person shall claim, acquire or exercise rights with respect to the minerals recovered from the Area except in accordance with this Part. Otherwise, no such claim, acquisition or exercise of such rights shall be recognized	**Commonalities with art 11(3) MA. Importance to maintain the principles in a future regime.**
Responsibilities and liability for damage	CRAMRA art 8 strict liability of the operator in case damage occurs to the environment and the Sponsoring State can be held liable for damage caused by the Operator	Article 139 Responsibility to ensure compliance and liability for damage1. States Parties shall have the responsibility to ensure that activities in the Area, whether carried out by States Parties, or state enterprises or natural or juridical persons which possess the nationality of States Parties or are effectively controlled by them or their nationals, shall be carried out in conformity with this Part. The same responsibility applies to international organizations for activities in the Area carried out by such organizations. 2. Without prejudice to the rules of international law and Annex III, article 22, damage caused by the failure of a State Party or international organization to carry out its responsibilities under this Part shall entail liability; States Parties or international organizations acting together shall bear joint and several liability. A State Party shall not however be liable for damage caused by any failure to comply with this Part by a person whom it has sponsored under article	**Commonalities with art 14. Maintain the principle of liability for damage.**

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/ 1979 Moon Agreement**
		153, paragraph 2(b), if the State Party has taken all necessary and appropriate measures to secure effective compliance under article 153, paragraph 4, and Annex III, article 4, paragraph 4. 3. States Parties that are members of international organizations shall take appropriate measures to ensure the implementation of this article with respect to such organizations.	
Benefit of mankind	Preamble Antarctic Treaty: Convinced that the development of a Comprehensive regime for the protection of the Antarctic environment and dependent and associated ecosystems is in the interest of mankind as a whole	Article 140 Benefit of mankind 1. Activities in the Area shall, as specifically provided for in this Part, be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States, whether coastal or land-locked, and taking into particular consideration the interests and needs of developing States and of peoples who have not attained full independence or other self-governing status recognized by the United Nations in accordance with General Assembly resolution 1514 (XV) and other relevant General Assembly resolutions. 2. The Authority shall provide for the equitable sharing of financial and other economic benefits derived from activities in the Area through any appropriate mechanism, on a non-discriminatory basis, in accordance with article 160, paragraph 2(f)(i).	**Art I OST/Art 4 MA on the province of all mankind and 11 MA on CHM. Commonalities as the spirit is the same** and needs to be maintained.
Benefits sharing		Article 140 Benefit of mankind 2. The Authority shall provide for the equitable sharing of financial and other economic benefits derived from activities in the Area through any appropriate mechanism, on a non-discriminatory basis, in accordance with article 160, paragraph 2(f)(i).	**Art I OST and art 11(7)d: stipulates "an equitable sharing in the benefits derived from the resources"** **Need to define how the sharing will be done**
Developing countries	CRAMRA art 6 Cooperation and international participation is promoted, including with other interested Parties, including developing countries	Article 148 Participation of developing States in activities in the Area The effective participation of developing States in activities in the Area shall be promoted as specifically provided for in this Part, having due regard to their special interests and needs, and	**Differences.** **The notion of developing countries needs to be replaced by**

Appendix IV Antarctic Treaty System, Law of the Sea, 1967 Outer Space Treaty and 1979 Moon Agreement Comparative analysis Table

Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/ 1979 Moon Agreement**
		in particular to the special need of the land-locked and geographically disadvantaged among them to overcome obstacles arising from their disadvantaged location, including remoteness from the Area and difficulty of access to and from it.	**future space country.**
Research activities	Art 3 Protocol Environmental Principles 1 The protection of the Antarctic environment and dependent and associated ecosystems and the intrinsic value of Antarctica, including its wilderness and aesthetic values and its value as an area for the conduct of scientific research, in particular research essential to understanding the global environment, shall be fundamental considerations in the planning and conduct of all activities in the Antarctic Treaty are	Art 143 Marine scientific research (…) The Authority may carry out marine scientific research concerning the Area and its resources, and may enter into contracts for that purpose. The Authority shall promote and encourage the conduct of marine scientific research in the Area, and shall coordinate and disseminate the results of such research and analysis when available. 3. States Parties may carry out marine scientific research in the Area. States Parties shall promote international cooperation in marine scientific research in the Area by: (a) participating in international programmes and encouraging cooperation in marine scientific research by personnel of different countries and of the Authority; (b) ensuring that programmes are developed through the Authority or other international organizations as appropriate for the benefit of developing States and technologically less developed States with a view to: (i) strengthening their research capabilities; (ii) training their personnel and the personnel of the Authority in the techniques and applications of research; (iii) fostering the employment of their qualified personnel in research in the Area; (c) effectively disseminating the results of research and analysis when available, through the Authority or other international channels when appropriate.	**Commonalities with art 6 MA freedom for scientific investigation.**
Protection of the environment	Protocol art 3 Environment principles Protocol Annex II Protection of fauna and flora Protocol Annex IV Prevention of marine pollution	Article 145 Protection of the marine environment Necessary measures shall be taken in accordance with this Convention with respect to activities in the Area to ensure effective protection for the marine environment from harmful effects which may arise from such activities. To this end the Authority shall adopt appropriate rules, regulations and procedures (…)	**Art IX OST/art 7 MA Commonalities**
Principles for the resources	Protocol Annex V Area protection and management	Article 150 Policies relating to activities in the Area (extract)	**art 11(7) also provides the**

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Key Topics	**1959 Antarctica Treaty** **1988 CRAMRA (not applicable)** **1991 Protocol**	**UNCLOS 1982 Law and Part XI on the Area**	**1967 OST/** **1979 Moon Agreement**
	CRAMRA Chapter III Prospecting Art 37 1. Prospecting shall not confer upon any Operator any right to Antarctic mineral resources. 2. Prospecting shall at all times be conducted in compliance with this Convention and with measures in effect pursuant to this Convention, but shall not require authorisation by the institutions of this Convention. (..) CRAMRA Chapter IV exploitation Art 39 Requests for Identification of an Area for Possible Exploration and Development CRAMRA Chapter V Development Article 53. Application for a Development Permit 1. At any time during the period in which an approved Management Scheme and exploration permit are in force for an Operator, the Sponsoring State may, on behalf of that Operator, lodge with the Regulatory Committee an application for a development permit. 2. An application shall be accompanied by the fees established by the Regulatory Committee in accordance with Article 43(2)(b) (…).	Activities shall be carried out in such a manner as to foster healthy development of the world economy and balanced growth of international trade, and to promote international cooperation for the over-all development of all countries, especially developing States" (…). Following this strong statement, Article 150 enunciates policies and notably: the development of the resources of the Area, the rational management of the resources, the increased availability of the minerals derived from the Area to ensure supplies to consumers of such minerals, the promotion of just and stable prices remunerative to producers and fair to consumers, the enhancement of opportunities for all States Parties, irrespective of their social and economic systems to participate in the development of the resources of the Area and the prevention of monopolization of activities, the protection of developing countries from adverse effects on their economies or the development of the common heritage of mankind as a whole. The Authority has very large powers including right to authorize production, power to limit the level of production	**fundamental principles the future international regime should content. Some adaptations will be needed to have a stronger regime. The UNCLOS provides a significant role to the Authority.**
The authority & the organs	CRAMRA art 18 Commission CRAMRA art 23 Advisory Committee CRAMRA art 28 the Special Meeting of the Parties CRAMRA art 29 Regulatory Committees CRAMRA art 33 the Secretariat	Art 156: the international seabed authority: all States Parties Art 160 The Authority, the supreme organ Art 161 The Council, the executive organ of the Authority	**No body foreseen in the OST or Moon. Differences. Need to set up such bodies for the exploitation of the resources**

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