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# The commercial exploitation of natural resources of the Moon and other celestial bodies: what role for the Moon Agreement?

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## Abstract

The first decade of the new century has been characterized by a renewed interest of States in exploring the Moon and eventually exploiting for commercial purposes its natural resources. The major space powers have launched missions aimed at studying the mineral composition of the Moon and identifying the best lunar site to establish a permanent manned basis.

This interest for the Moon calls for the analysis of the existing legal regime governing activities on the Moon and its ability to properly regulate current and future lunar activities. Particular attention must be paid to the Moon Agreement, as it is the only legal instrument dealing with the exploration, use and exploitation of the Moon and its natural resources.

The Moon Agreement has been ratified by only 13 States, not including the space-faring States. This paper addresses the question: what role is the Moon Agreement expected to play in the era of the commercial exploitation of lunar resources?

The paper argues that the Agreement is likely to have a rather limited impact on future lunar activities. Due to the diverging interpretations by developed and developing States of the provisions of Article 11 of the Agreement, declaring the Moon and its natural resources “the common heritage of mankind” and to the potential detrimental effect that these provisions may have on the commercial use of lunar resources, it is highly questionable that States would decide to join the Agreement. Hence, the need for establishing a new set of rules regulating the exploitation of lunar resources arises.

## INTRODUCTION

After several decades characterized by a lack of interest in the Moon, the last 5-6 years have seen a renewed attention of States and private operators in exploring the Earth’ satellite, and possibly exploiting its natural resources. Some of the major space-faring States, *inter alia* the United States<sup>1</sup>, China<sup>2</sup>, Japan<sup>3</sup> and India<sup>4</sup>, have launched robotic missions aimed at analyzing the mineral composition of the Moon soil. Until recently, the United States and China had the most ambitious lunar programs which, in either case, included a manned mission to the Moon. However, following the recent decision of the Obama administration to back-off from the “lunar race”<sup>5</sup>, China emerges as the most influential actor as far as lunar activities are concerned.

This widespread interest in the Moon and its natural resources raises issues related to the ability of the space law regime to

ensure the safe and orderly development of current and future lunar activities, particularly those having the purpose of exploiting the natural resources of the Moon for commercial reasons. In this respect, the analysis must focus on the Moon Agreement, as it is the only legal instrument specifically addressing the issue of exploration, use and exploitation of the Moon and its natural resources.

The Moon Agreement<sup>6</sup> is the less successful among the five existing space<sup>7</sup> treaties. Only 13 States have ratified it, not including the space-faring States.

Several reasons may be put forward to explain the failure of this Agreement. For example, the fact that by the time the final text of the Moon Agreement was finalized in 1979, the Moon did no longer represent a priority for the two space powers, the United States and the Soviet Union. At the beginning of the 1980’s, these two States decided to invest resources in space

activities able to generate immediate financial and social benefits, e.g. the deployment of telecommunication satellites.

Nevertheless, it is generally accepted that the main reason for the failure of the Moon Agreement is attributable to the provisions of its Article 11, declaring the Moon and its natural resources to be “the common heritage of mankind”.

Taking into consideration the present interest in the Moon and the reluctance of States to ratify the Moon Agreement, this paper will address the following two questions: 1) Is the Moon Agreement the proper instrument to govern future exploitative lunar activities? 2) Are an amended version of the Agreement or a whole new treaty needed to ensure the proper regulation of the commercial use of lunar resources? This paper supports the second hypothesis.

The need for new rules governing the exploitation of the Moon’s natural resources also stems from the fact that the Moon Agreement being inapplicable, the existing space law framework does not provide clear and detailed provisions on how this exploitation should be carried out. In this regard, the only relevant binding instrument is the 1967 Outer Space Treaty<sup>8</sup> which, however, is not able to fill this gap alone.

The absence of specific rules dealing with the commercial use of lunar resources is detrimental to the interest of those subjects, both of public and private nature, who consider such exploiting such resources a potentially valuable business. The lack of a clear and predictable legal framework to protect their investments and their probable profits, discourage these subjects to invest their financial and technical resources in the exploitation of the natural resources of the Moon.

### LUNAR RESOURCES

The Moon is rich in mineral resources. Lunar missions have proved that the Moon contains large amounts of aluminum, iron,

oxygen, silicon, hydrogen, potassium, chromium, manganese and other minerals. These minerals can be either transported to Earth or used *in situ* to support the activities of a permanent lunar basis and the life of its inhabitants. Lunar minerals can be utilized in their original form or refined into structural and electric materials.

A recent NASA mission called Lunar Crater Observation and Sensing Satellite has also confirmed the existence of water deposits at the south pole of the Moon. These deposits could prove to be of fundamental importance to support the life of astronauts on the Moon.

The most valuable resource contained on the Moon, however, is Helium-3. Helium-3 is an isotope, barely present on Earth but abundant on the Moon which, combined with other materials, can be used as fuel in fusion power reactors. The value of Helium-3 stems from the fact that it can generate power and, as a result, energy in a clean way, namely through a process of nuclear fusion which does not generate toxic waste. Due to these special characteristics the mining of Helium-3 can have a potentially enormous impact on the way energy is produced and made available on Earth. Indeed, Helium-3 could replace fossil fuels and other substances as primary source of energy on Earth.

### THE LEGAL STATUS OF THE MOON: FROM THE OUTER SPACE TREATY TO THE MOON AGREEMENT

The legal status of the Moon is laid down in the Outer Space Treaty<sup>9</sup> and the Moon Agreement.

Article I and II of the Outer Space Treaty confer outer space, including the Moon, the status of a *res communis omnium*<sup>10</sup>. *Res communis omnium* is a terminology coming from Roman law used to identify an area not capable of being appropriated by any State and open for free exploration and use. While Article II affirms that States are prohibited from extending their territorial sovereignty over outer space or

any of its parts, by declaring that: "Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claims of sovereignty, by means of use or occupation, or by any other means"<sup>11</sup>, Article I provides all States, without discrimination of any kind, with the right to freely accede, explore and use outer space as well as to carry out scientific operations in outer space<sup>12</sup>.

A key issue, which is not directly addressed by Article II of the Outer Space Treaty, concerns the appropriation of outer space resources. The question is whether or not the prohibition to appropriate outer space is also applicable to its resources. On this point there is no agreement within the legal community.

A limit to the appropriation of extraterrestrial resources can be found in Article I, paragraph 1 of the Outer Space Treaty, stating 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 and scientific development, and shall be the province of all mankind". In short, paragraph 1 means that the exploration and use of outer space, being the province of all mankind, should not be beneficial only to the States actually capable of exploring and using outer space but to all States. This, however, does not include any mandatory sharing of benefits resulting from space activities.

When the US were able to successfully complete their first manned lunar mission in 1969 and samples of lunar rock, the building of a permanent lunar station and the possibility to exploit lunar resources appeared like a feasible possibility in the close future. Due to the fact that the Outer Space Treaty laid down general principles which were not considered to be detailed enough to provide appropriate solutions to the problems which could arise in the course of future lunar activities, the negotiation of a new agreement, namely the Moon Agreement began.

## THE MOON AGREEMENT

### Preliminary considerations

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, better known as Moon Agreement, was adopted on 5 December 1979, opened for signature on 18 December 1979, and entered into force on 11 July 1984. As of 1 May 2010 the Moon Agreement has 13 ratifications, with an additional four States being signatories to it<sup>13</sup>.

The Moon Agreement<sup>14</sup> follows the Outer Space Treaty in many respects. Firstly, it reaffirms the non-appropriative nature of the Moon, by stating in Article 11, paragraph 2, that national appropriation of the Moon or any of its parts is prohibited. This concept is elaborated by paragraph 3 of the same Article, stating that the placement of personnel, space vehicles, facilities, stations and installations on or below the surface and subsurface of the Moon does not confer any ownership right over the surface or subsurface of the Moon or any areas thereof. The Moon Agreement also reaffirms the idea that the exploration and use of the Moon is the province of all mankind. This idea is further developed in the sense that such exploration and use shall be carried out with due regard to the interest of present and future generations<sup>15</sup> and in a way which does not result in the disruption of the lunar environment<sup>16</sup>.

In addition the Moon Agreement expands the freedom of scientific cooperation in outer space already laid down in Article I, paragraph 3 of the Outer Space Treaty. In particular, States parties are provided with the right to collect samples of lunar mineral resources and other substances and to use them for scientific purposes and the right to land space objects, place personnel, equipment and facilities and to establish manned and unmanned space stations on the Moon<sup>17</sup>.

The most innovative, as well as controversial, provisions of the Moon Agreement are contained in Article 11, declaring the Moon and its natural

resources to be “the common heritage of mankind”.

#### The common heritage of mankind

For a legal point of view the common heritage of mankind concept<sup>18</sup> is an evolution of the *res communis omnium* theory. However, the former differs from the latter in many respects. It is based on the idea that all human beings should be given the same opportunities for improving their economic and living conditions. Starting from this idea, it holds that all States acting together should manage certain areas which, due to the economic and scientific value of the resources contained there, are considered to be the common heritage of mankind. All activities within the common heritage of mankind area must be carried out in accordance with the rules established by an international regime, the main purpose of which is to guarantee the orderly development of the area and the equitable sharing of the benefits generated thereof, taking into particular consideration the needs of developing countries, regardless of their level of participation in such activities.

The problem of the common heritage of mankind has always been the different way of interpreting it by developing and developed States. According to the former, it includes common management of the common heritage of mankind area and common sharing by all States of the mined resources and the benefits generated therein. The latter refuse this interpretation. In their opinion the application of the common heritage of mankind concept should not result in significant changes to the existing conditions for access and use of areas beyond national jurisdiction. Eventually, this application could lead to a better distribution of the benefits resulting from those areas. However, it should be up to the States which have exploited these areas to decide how this distribution should be organized.

The hopelessness to reach an a common view about the contents and legal implications of the common heritage of mankind concept caused the failure of the two international instruments including this concept, namely the Moon Agreement and the 1982 Law of the Sea Convention.

#### Article 11 of the Moon Agreement

The text of Article 11 of the Moon Agreement was the most debated point during the negotiations of the Agreement. States held different opinions on how the common heritage of mankind had to be interpreted. These contrasts lasted until mid-1979 when consensus was reached on the provisions to be inserted in Article 11.

Article 11 paragraph 1 declares that: “The Moon and its natural resources are the common heritage of mankind”. Thus, while the Outer Space Treaty does not make reference to outer space resources, the Moon Agreement makes clear that the natural resources of the Moon are the common heritage of mankind. As a result, the commercial use of these resources shall be carried out only under this concept. Article 11 paragraph 3 specifies that: “neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall become the property of any States” or any other operator performing activities on the Moon.

Paragraph 5 contains the commitment of States parties to establish an international regime to govern the exploitation of the natural resources of the Moon, as soon as exploitation is about to become feasible. This regime should include provisions providing for: “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; 4) an equitable sharing by all States 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”.

It has been previously mentioned that the only to instruments included the common heritage of mankind concept, the Moon Agreement and the Law of the Sea Convention. Unlike the latter, the former does not establish an international regime to govern the exploitation of natural resources. Indeed, the Law of the Sea Convention sets out an International Seabed Authority responsible for licensing and managing the exploitation of resources located in the seabed beyond national jurisdiction as well as other provisions specifying on exploitative operations shall be carried out. The Moon Agreement only expresses the intention of its parties to negotiate a regime when the exploitation of lunar resources is about to become feasible. This is a provision with no mandatory character. Thus, it could be argued that the Moon Agreement leaves the issue of the legal regime to regulate lunar exploitative activities substantially unaddressed. If we take into consideration that one of the purposes of the negotiation of the Agreement was the setting up of a regime to regulate such exploitation, this purpose appears not to have been achieved. On the contrary, the solution to this issue is postponed to a future moment.

#### DETRIMENTAL EFFECTS OF THE MOON AGREEMENT ON THE COMMERCIAL USE OF LUNAR RESOURCES

When discussing about the potential impact of the Moon Agreement on the commercial exploitation of lunar resources a preliminary consideration has to be made: this exploitation is a risky and expensive venture. Firstly, many things can go wrong in space and a mission can result in a failure for unexpected and unpredictable reasons. Secondly, the development of the technology necessary to mine lunar resources requires huge financial commitments. These two

elements create serious barriers to the commencement of the exploitation of lunar resources. A solution to soften the negative impact of these factors is the establishment of a legal regime to regulate such exploitation. On one side, this regime can increase safety of space operations, by laying down rules to be complied with by participants to this exploitation; on the other side, it may encourage investments in the exploitation of lunar resources, by making clear the possibility to make a profit from it.

The question is if the Moon Agreement is able to create a clear and profitable legal environment to the development of the exploitation of lunar resources. Does it have a positive or negative impact on the commercial use of these resources? This paper argues that due to the uncertain character of the provisions of the Moon Agreement and to the fact they do not specify how this exploitation should be carried out, the Agreement has a detrimental effect on the commercialization of lunar resources.

According to Article 11 paragraph 7, one of the main purposes of the international regime is to “equitable sharing” by all parties in the benefits derived from the exploitation of lunar resources. However, the Treaty neither gives an interpretation of the term equitable nor indicates the methods under which this “sharing” should be organized. Developing and developed States have held diverging views on this point by contributing to make uncertain the meaning of this provision.

Another problem concerns the word “benefit”. What does the Agreement mean when using such word? To the lunar resources? To the profits resulting from their commercialization? The absence of clarity of this point is a serious shortcoming for potential investors, as they cannot know what they will be requested to share.

The Moon Agreement also leaves unanswered two questions: 1) Can property rights over lunar resources be acquired

once these resources have been removed from their original location? 2) Is there a prohibition on the exploitation of lunar resources pending the establishment of an international regime?

As to the first question, the majority of space law experts agree that once removed from their original location, lunar resources can become the property of whoever has extract them<sup>19</sup>. According to this interpretation, the use of the wording "prohibition to appropriate resources in place" in Article 11 paragraph 3 would support this view. Developing countries refuse this interpretation.

The second question refers to the presence of a moratorium on the removal and exploitation of lunar resources pending the establishment of an international regime. The Moon Agreement does not specifically impose such moratorium. Space-faring States and the majority of legal scholars<sup>20</sup> claim that the removal and exploitation of the natural resources of the Moon before the establishment of such regime is allowed. Again, this interpretation is rejected by developing States.

What is, then, the legal regime applicable to commercial activities on the Moon before the establishment of an international regime? Before such regime is set up, the applicable legal regime is not the common heritage of mankind but that laid down in the Outer Space Treaty, which provides States and private operators with the right to explore and use lunar resources. This argument is used some authors to argue that the Moon Agreement does not restrict the commercial exploitation of extraterrestrial resources but, on the contrary, it encourages it<sup>21</sup>. Moving from the assumption that until the regime is established there is no requirement to share benefits, these authors claim that in the pre-regime period the Moon Agreements gives private operators several chances to make profits. Later, when the legal regime is under negotiation, these operators will be in the position to protect their interests

and to create the conditions to keep making profits after the regime is set up.

This reasoning cannot be accepted. It is true that pending the establishment of a regime there is no requirement to share benefits, as the provisions of the Outer Space Treaty are applicable. However, this is only a temporary situation because as soon as the exploitation of lunar resources becomes feasible a legal regime, requiring the equitable sharing of benefits, is to be establishment. A similar perspective is not encouraging but rather detrimental to the interests of economic operators.

For example, if a private company, before the establishment of the legal regime, starts mining and commercial use of lunar resources with the expectation to keep the benefit derived from it, after this regime is set up that company would most probably find itself under the obligation to share the benefits arising from its commercial lunar activities. Obviously, a similar perspective is not very positive from an investor point of view. The uncertainty concerning the legal rules applicable to the exploitation of lunar resources and to the possibility to make a real profit from it, lead potential investors to invest their financial and technical resources to other business which offer a more clear and predictable legal framework.

Some could argue that States are not obliged to establish an international regime at all cost. If the pre-regime period is so profitable, States could decide not to set up any specific legal regime and keep using the provisions of the Outer Space Treaty. This approach would be quite risky, as the Outer Space Treaty contains general principles which are unable to provide solutions to all problems and legal issues which may emerge in the course of the exploitation of lunar resources.

The point is that for economic operators legal certainty is the key factor. In the case of the exploitation of the resources of the Moon, the non-ratification of the Moon Agreement does not represent a solution as the only applicable rules would be those of

the Outer Space Treaty, which have been proved to be insufficient to properly regulate it. However, the ratification of the Moon Agreement would not solve the problem either, as the Agreement does not establish a legal framework to govern the commercial use of lunar resources and contains provisions of uncertain interpretation. Therefore, the only option appears the drafting of a specific set of rules to regulate the exploitation of lunar resources, to be inserted either in an amended version of the Moon Agreement or in a new legal instrument.

#### DEVELOPMENTS IN COPUOS

In the last four years the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (COPUOS) has paid particular attention to the issue of the low ratification of the Moon Agreement. In this respect, the Working Group on the Status and Application of the Five United Nations on Outer Space has been given a special mandate to deal with it. This development must be read in conjunction with a more general effort undertaken by the Legal Subcommittee aimed at enhancing adherence to the five UN space treaties<sup>22</sup>.

The initiative to start a discussion on the Moon Agreement was launched by the representative of Colombia during the 2007 Session. Firstly, he pointed out the fact that the review of the status and application of the five space treaties required a more substantive and qualitative approach rather than a simple collection of data on the status of the treaties. In this respect, the Colombian representative declared that in the light of the current and potential activities on the Moon, special attention should be paid to the reasons for the low number of ratifications of the Moon Agreement and that efforts should be made to solve obstacles to its ratification. It was also added that the question on whether or not the existing international and national rules adequately

regulate activities on the Moon should be addressed.

The Legal Subcommittee accepted this proposal and agreed that, starting from the 2008 session, the Working Group would discuss the reasons behind the low ratification of the Moon Agreement. In this respect, States could: a) address activities being carried out or to be carried out on the Moon; b) identify the benefits of adherence to the Moon Agreement; c) identify international and national rules governing activities on the Moon; d) assess whether existing international rules adequately address activities on the Moon. Agreement was also reached on the fact that the Secretariat should prepare a background paper on activities being carried out or to be carried out on the Moon, international and national rules governing those activities and information from States parties to the Moon Agreement about the benefits of adherence to that agreement. This background paper should have been based mostly on information provided by Member States.

At the 2008 session of the Legal Subcommittee the Secretariat presented the requested background paper. However, at the moment this paper was presented the Secretariat had received no information from Member States, not even those States undertaking or planning to undertake lunar activities. This fact shows the little interest that States carrying out Moon activities have in the Moon Agreement. In this regard, it is relevant to notice that during the COPUOS session in the period 2006-2010 none of these States have expressed the intention to ratify the Moon Agreement in the near future.

In the course of the debate States held diverging views, ranging from those arguing that some of the provisions of the Moon Agreement may enhance the implementation of space projects, activities and missions and may facilitate scientific cooperation, to those claiming that the non-adherence to the Agreement had not hindered current lunar activities and that

operations on the Moon were adequately addressed and regulated under the Outer Space Treaty.

In addition to this, a very important point was raised by Austria, one of the few States which has ratified the Moon Agreement. Austria declared that it was ready to consider revisions to the text of the Moon Agreement, while preserving its basic legal concepts, if this could enhance its chance of being more widely accepted. This proposal is extremely significant as it opens the way for the possibility to introduce amendments to the text of the Moon Agreement. It also shows the realism of the Austrian delegation, which has properly understood the usefulness to keep proposing a legal text which has not encountered the favor of States in its original version.

The 2008 Session of the Working Group was also characterized by the submission of a Joint Statement on the benefits of adherence to the Moon Agreement by Austria, Belgium, Chile, Mexico, the Netherlands, Pakistan and the Philippines, all parties to the Moon Agreement. The statement will be addressed later in this section.

During the 2009 session of the Legal Subcommittee the debate on the low ratification of the Moon Agreement continued. While some delegations considered the joint statement on the benefits of adherence to the Moon Agreement a useful basis for discussion, others stated that some aspects of it should be further clarified. Some States declared that more analysis should be dedicated to understand the reasons of the failure of the Agreement and, in this respect, the concept of the common heritage of mankind should be dealt upon. It was anyway agreed that it was too early to arrive at any conclusion on the adequacy of the existing international rules governing Moon activities.

The analysis now turns to the joint statement on the benefits of adherence to the Moon Agreement. The first

consideration to be made about it is that it represents the first official action taken by the State parties to the Moon Agreement to convince other States to join it. This cannot be considered as a fact of secondary importance.

Looking at the contents of the statement, two points emerge. The first one refers to the innovative character of the Moon Agreement. The statement claims that while the Agreement reiterates many provisions of the Outer Space Treaty, it also introduces new elements which were not present in that Treaty, such as provisions on the establishment of a lunar station, the prohibition of acquisition of property, the use and jurisdiction over vehicles and equipments and the use of lunar resource to sustain the activities on the lunar surface. These provisions clarify concepts contained in the Outer Space Treaty and facilitate scientific cooperation. The second point concerns Article 11 of the Agreement. According to the joint statement, the solution adopted in the Moon Agreement to postpone the creation of a legal regime to regulate the exploitation of lunar resources is an intelligent one. In this way once this exploitation is about to be feasible, States would be able to set out a regime taking into consideration the political, legal and technical requirements existing at that time. It is also argued that such solution does not preclude the exploitation of lunar resources, provided that it is carried out in accordance with the common heritage of mankind.

As to the first point two considerations can be made. On one hand, it is true that the Moon Agreement introduces provisions which may enhance scientific cooperation and may make clearer the conditions to carry out scientific activities on the Moon. On the other hand, some of the principles contained in these provisions are not new, as they can be deemed to belong to the category of customary principle of space law. For example, the right of States to collect and use for scientific reasons lunar



samples exists and is recognized since the time of the lunar operation carried out in the 1960' and 1970's by the US and the USSR. In addition, the right to establish a space station in space in order to carry out scientific research is already recognized as being attributed to States. When the construction of an International Space Station around the Earth begun, no one contested the validity of such conduct under the existing space law rules. Following this reasoning, it would be difficult to argue that a station build on the lunar surface to perform scientific research be illegal. The Moon belongs to outer space. Hence, according to the Outer Space Treaty, the same legal regime applicable to activities taking place in the orbit outside the Earth should govern activities on the Moon having the same nature and scope.

Moreover, the provision of the Moon Agreement concerning jurisdiction over personnel and vehicles seems to add very little to the principles already included in Article VIII of the Outer Space Treaty.

It may concluded that the existing space law rules, not including those of the Moon Agreement, provide an adequate legal framework to regulate scientific activities on the Moon. A hypothetic ratification of the Moon Agreement does not seem to bring so many benefits as the joint statement argues.

As far as the second major point of the joint statement is concerned, it has already been described in the previous section of this paper how the choice of the Moon Agreement to postpone to a future time the setting up of a regime to govern the exploitation of lunar resources has a negative rather than positive effect. It generates uncertainty on the legal framework applicable to such exploitation and discourages potential investors to allocate financial resources to it.

In addition the joint statement does not address issues concerning the existence of a moratorium pending the establishment of a legal regime and the interpretation of the

term "resources in place" contained in Art. 11 (3) of the Agreement.

### THE EXPLOITATION OF THE NATURAL RESOURCES OF THE MOON: A LEGAL REGIME

When discussing about developing a legal regime to regulate the exploitation of lunar resources<sup>23</sup> two preliminary elements have to be taken into account. First, such exploitation is not likely to take place unless space-faring States and private operators are involved in it. Only these subjects have the financial and technical expertise to carry out extraterrestrial exploitative activities. Therefore, the legal regime must address the issues arising from their participation in the exploitation of lunar resources and must include provisions which are able not only to protect their interests but also to provide them with a real chance to enjoy a return on the investments they made to perform exploitative operations on the Moon.

Secondly, the legal regime to govern the exploitation of the natural resources of the Moon should be based on the principles laid down in the Outer Space Treaty. These principles have maintained outer space a peaceful environment in the last 43 years. Hence, they should keep a fundamental role also with regard to future space activities.

The majority of lunar natural resources consist of minerals. These minerals need to be removed from their original location. Thus, it is logical to expect that the exploitation of these minerals will be structured in a three-phase process: 1) a pre-mining phase; 2) a mining phase; 3) a post-mining phase.

The legal regime should establish rules applicable to all aspects of each. In this way, operators will have a clear picture of the legal framework applicable during the entire period in which the exploitation of extraterrestrial resources is taking place.

A possible solution to enable the safe and orderly development of such exploitation would be the establishment of an

international authority. In this respect, the solution adopted by the 1994 Agreement of Part XI of the Law of the Sea Convention provides a useful example. The 1994 Agreement proposes a new interpretation of the common heritage of mankind concept which softens the stricter economic requirements of the original common heritage of mankind version, such as the mandatory transfer of benefits, introduces a free market approach and gives developed States an importance proportionate to their impact on exploitative activities, particularly the power to influence the decision-making mechanism of the authority. A regime which contains these elements could encounter the favour of the majority of States, particularly taking into account the fact that the 1994 Agreement has been accepted by both developed and developing States.

The proposed legal regime should also contain: a) a licensing mechanism to authorize private exploitative activities, either by means of national law or by decision of the international authority; b) a mechanism to control exploitative activities; c) provisions dealing with liability for damage caused to the lunar environment in the course of exploitative operations; d) a procedure for international registration of the exploitative activities taking place on the lunar surface; e) a mechanism to settle disputes.

As previously described the legal regime to regulate the commercial exploitation of lunar resources could be either inserted in an amended version of the Moon Agreement or in a new legal instrument. In the first case, the majority of the provisions of the Moon Agreement, in particular those concerning scientific operations on the Moon, should be maintained. Instead, the provisions of Art. 11 should be replaced by new ones providing clear and detailed rules to govern lunar exploitative activities. This option may have a chance of success, especially if we take into consideration the willingness of the current States parties to

the Moon Agreement to amend it in case this choice could contribute to give the Agreement higher chances of success.

If consensus on an amended version of the Moon Agreement could not be reached, a new instrument containing rules to manage the exploitation of lunar natural resources would represent the only option. Drafting a new instrument would not be an easy task and would likely take much longer than amending an existing one. However, such drafting process would represent a unique opportunity to discuss obstacles to the exploitation of lunar resources and to arrive at an agreed solution on how this exploitation should be organized and what should be the rights and duties of the parties involved by, thus, contributing to create a favorable legal environment for the beginning of the exploitation of lunar resources.

### CONCLUSION

Considering the renewed interest in the Moon and its natural resources, it is due time to discuss about the ability of the Moon Agreement to properly regulate current and future lunar activities. This paper supports the idea that due to the uncertain meaning of its provisions and its failure to set up a specific legal regime, the Moon Agreement, as it stands now, does not represent the appropriate instrument to regulate the commercial exploitation of lunar resources. New and specific rules to govern such exploitation should be developed. These rules should be included in an amended version of the Moon Agreement or in a new legal instrument.

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<sup>1</sup> On June 18, 2009, the United States has launched the Lunar Reconnaissance Orbiter (LRO) mission aimed at studying the physical composition of the Moon, see: <http://lunar.gsfc.nasa.gov/>.

<sup>2</sup> The Chinese Moon Exploration Programme includes the following objectives: a) analysis of the

Moon's composition by satellite; b) to deploy two Moon rovers for surface exploration; 3) a sample return mission by 2017; 4) a manned mission by 2025-2030. On October 24, 2007, the first spacecraft of the program Chang'e, namely Change-1, was launched. The purpose of Change-1 was to study the composition and quality of the lunar resources. Change-1 mission ended in November 2009.

<sup>3</sup> On 14 September 2007 Japan launched the Selene mission to study the Moon history and its physical composition.

<sup>4</sup> On October 22, 2008 India launched its first lunar mission, Chandrayaan 1. The purpose of the mission was to map the lunar surface so as to get a better knowledge of the mineral contained on the Moon. The mission ended on 29 August 2009.

<sup>5</sup> The former US President George W. Bush launched the Constellation Program which foresaw the return of US astronauts on the Moon by 2020 and the establishment of a permanent lunar basis on the lunar surface. The Obama administration has announced its intention to stop the Constellation Program and to devote its financial resources to achieve other space related objectives and developments.

<sup>6</sup> Agreement Governing the Activities of States on the Moon and other Celestial Bodies, 5 December 1979, 1363 U.N.T.S. 3, 18 I.L.M. 1434 (hereinafter Moon Agreement).

<sup>7</sup> The five space treaties are: the 1967 Outer Space Treaty, the 1968 Rescue Agreement, the 1972 Liability Convention, the 1975 Registration Convention and the 1979 Moon Agreement.

<sup>8</sup> 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 U.N.T.S. 205, 18 U.S.T., 2410, T.I.A.S. No. 6347, 6 I.L.M. 386 (hereinafter Outer Space Treaty).

<sup>9</sup> For a description of the provisions of the Outer Space Treaty see: C.Q. Christol, *The Modern International Law of Outer Space* (1982) New York, p. 21 ss; B. Cheng, *Studies in International Space Law*, (1997), Oxford p. 215 ss.

<sup>10</sup> The *res communis* concept is described in I. Brownlie, *Principles of Public International Law*, Oxford, Seventh ed., (2008), p. 105, 169.

<sup>11</sup> For an analysis of Article II of the Outer Space Treaty see: S. Gorove, "Interpreting Article II of the Outer Space Treaty", in Proceedings of the Eleventh Colloquium on the Law of Outer Space, (1968), p. 40, p. 18; C.Q. Christol, "Article II of the Outer Space Treaty Revisited", 9 *Annals of Air & Space L.* 217 (1984).

<sup>12</sup> For a description of Article I of the Outer Space Treaty see G. Gal, *Space Law*, (1969), New York, Budapest, p. 139; E. Galloway, "The United States and the 1967 Treaty on Outer Space", in

Proceedings of the Fortieth Colloquium on the Law of Outer Space, (1997), p. 18.

<sup>13</sup> Thirteen States have ratified the Moon Agreement: Australia, Austria, Chile, Mexico, Morocco, the Netherlands, Pakistan, the Philippines, Uruguay, Kazakhstan, Belgium, Peru and Lebanon. Four additional States have signed it: France, Guatemala, India and Romania

<sup>14</sup> On the Moon Agreement see: G. Zhukov & Y. Kolosov, *International Space Law*, (1984), Moscow, p. 173; B. Cheng, *supra*, endnote 9, p. 246; H.W. Bashor Jr., *The Moon Treaty Paradox* (2004).

<sup>15</sup> See Article 4, para. 1, Moon Agreement.

<sup>16</sup> See Article 7, para. 1, Moon Agreement.

<sup>17</sup> See respectively Article 4, para. 1, Article 8, paras 1 and 2 and Article 9, para. 1, Moon Agreement.

<sup>18</sup> For a description of the Common Heritage of Mankind see: C.C. Joyner, "Legal implications of concept of the common heritage of mankind", in 35 *Int'l & Comp. L.Q.* 190, (1986); G.M. Danilenko, "The concept of the common heritage of mankind in international law", 13 *Annals Air & Space L.* 247, (1988).

<sup>19</sup> See: C. Christol, "The 1979 Moon Agreement: where is it today?", 27 *Journal of Space L.* 1, (1999); H.L. Van Traa-Engelman, "Clearness regarding property rights on the Moon and other celestial bodies", in Proceedings of the Thirty-Ninth Colloquium on the Law of Outer Space, (1996), p. 38.

<sup>20</sup> See M. Williams, "The law of outer space and natural resources", in 36 *Intern. & Comp. L. Quarterly* 142, (1987); P.M. Sterns, G.H. Stine & L.I. Tennen, "Preliminary Jurisprudential Observation Concerning Property Rights on the Moon and Other Celestial Bodies in the Commercial Age", in Proceedings of the Thirty-Ninth Colloquium on the Law of Outer Space, (1996), p. 49.

<sup>21</sup> On this point see: R. Jakhu, "Twenty years of the Moon Agreement: space law challenges for returning to the Moon", *ZLW* 54, Jg. 2/2005, p. 243.

<sup>22</sup> For the report of the sessions of the Legal Subcommittee and the unedited transcripts of the meetings see at: <http://www.unoosa.org/oosa/en/COPUOS/Legal/index.html>.

<sup>23</sup> This author has elaborated a proposal for a legal regime to regulate the exploitation of extraterrestrial natural resources in: F. Tronchetti, *The exploitation of natural resources of the Moon and other celestial bodies: a proposal for a legal regime*, Martinus Nijhoff Publishers, Leiden/Boston, (2009).