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A legal regime to govern the exploitation of the natural resources of the Moon and other celestial bodies

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Contents

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I. Introduction

Until the beginning of the XXIst century, the exploitation of the natural resources of the Moon and other celestial bodies has represented no more than a dream and just a topic for science-fiction romance. Nowadays, however, the situation is rapidly changing. Thanks to remarkable advancements and innovations in space technologies and launch vehicles and to the interest showed by States and, in particular by private operators, for extracting and using these resources, the day in which the exploitation of extraterrestrial resources begins is coming near fast[1].

Nevertheless, in order to allow such an exploitation to start a major obstacle must be solved, namely the absence within the space law regime of specific rules establishing how this exploitation has to take place and what are the rights and duties of the parties involved in it. As it will be explained in the following paragraphs, space law does not contain any dedicated rule, dealing with the exploitation of extraterrestrial resources, which has received the general acceptance of States. This situation has generated uncertainty among States and private operators interested in these resources and have prevented them from investing money and technologies in exploitative activities in outer space.

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1) In 2004 the United States has launched the Vision for Future Space Exploration (see at http://www.nasa.gov/externalflash/Vision/index.html). The Vision foresees the manned return on the Moon by 2020, the establishment of a permanent manned basis on the lunar surface and to use the Moon as a basis for future space exploration. The US has also planed to launch the Lunar Reconnaissance Orbiter (LRO) for late 2008. LRO will study the physical nature of the Moon by focusing particular attention on the Polar Regions. See for further details at: http://lunar.gsfc.nasa.gov/mission.html. China is also very interested in the lunar resources. It has started the Moon exploration programme, whose purposes are: 1) the analysis of the Moon' composition by satellite; 2) the launch of a rover on the Moon's surface by 2012; 3) a manned mission by 2017. China has launched on October 24, 2007, the fist spacecraft of the programme Chang'e-1, for studying the composition and quality of the lunar resources. China has already planned the launch of Chang'e 2 in order to install a lunar lander for the surface exploration of an area of the Moon. See in this respect at: http://www.spacedaily.com/reports/China_Moon_Mission_ChangE_1_In_Good_Condition_999.html and at: http://www.universetoday.com/2007/10/24/chinese-moon-mission-blasts-off/.

This situation has to be modified. This paper aims at fulfilling this purpose by putting forward b a legal regime to manage and regulate the exploitation of the natural resources of the Moon and other celestial bodies[2]. In the opinion of this author, such a legal regime not only will stimulate the participation of States and private operators in this exploitation but also only will contribute to its safe and orderly development. The legal regime presented in this paper tries to strike a balance between the need for preserving the existing space law principles and the need for stimulating the participation of space-faring nations and private operators in such exploitation.

II. Why exploiting the Moon and other celestial bodies? The presence of natural resources on the surface and subsurface of the Moon and other celestial bodies

Before proceeding with the description of the legal regime regulating the exploitation of extraterrestrial resources, it is necessary to understand why States and private operators are so interested in making such exploitation a reality.

The Moon and other celestial bodies of our solar system contain large quantity of natural resources. The use of these resources represents a unique opportunity of development for mankind and may significantly contribute to

2) For an analysis of the possibilities to exploit the resources of the Moon and other celestial bodies for commercial purposes see: Kosmo, "*The commercialization of space: a regulatory scheme that promotes commercial ventures and international responsibility*", 61 S. Cal. L. Rev. 1055, (1987-88); Hofmann, "*Recent plans to exploit the Moon resources under international law*", in Proceedings of the Forty-Seventh Colloquium on the Law of Outer Space, (2004), p. 425; Lee, "*Creating an international regime for property rights under the Moon Agreement*", in Proceedings of the Forty-Second Colloquium on the Law of Outer Space, (1999), p. 409; Lewis-Lewis, "*A proposed international regime for the era of private commercial utilization of space*", 37 Geo. Wash. Int'l L. Rev. 745, (2005);

the betterment of conditions of people on Earth.

As to the Moon, it presents vast amount of mineral resources distributed uniformly across its surface and subsurface. Manned and unmanned explorations have demonstrated that the Moon is rich of aluminum, iron, silicon, oxygen, hydrogen, chromium, manganese, potassium, etc. These minerals can be utilized in their original form or refined into structural and electrical materials. They can be brought back to Earth or used for life support of a permanent lunar basis or as rocket propellant. For instance, oxygen and hydrogen are contained in the lunar regolith at all latitudes.

There is also evidence that the lunar poles contain amounts of water-ice. It is still not well-known how vast this amount is. However, in case of a large presence of water, this could have an enormous impact as rocket propellant and life-support materials for astronauts.

The most valuable resource contained on the Moon, however, is Helium-3. Helium-3 represents, indeed, the main reason behind the attention of States and private operators for exploiting extraterrestrial resources.

Helium-3 is an isotope, rare on Earth but abundant on the Moon, which combined with other materials, such as deuterium, can be used as a fuel in fusion power reactors. The value of Helium-3 is that it can generate nuclear power and, as a consequence, energy in a clean way, namely through a process of nuclear fusion which does not produce toxic waste. Thanks to these special characteristics, the extraction of Helium-3 is likely to have a huge impact on the way energy is produced and distributed on Earth. As it is well-known, mankind is currently facing an energetic crisis. The stocks of raw materials are running out and experts estimate that fossil fuels will be finished by 30-40 years. Helium-3, indeed, has the potential to solve this crisis thanks to its capacity to replace fossil fuels and other substances as primary source of energy on Earth[3].

As to the resources contained in the celestial bodies others than the Moon,

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3) .It has been estimated that 25 tonnes of Helium-3 can provide all the power that the United States needs in a year, See Sci/Tech. Moon map aids discovery at http://news.bbc.co.uk/1/hi/sci/tech/226053.stm

it has been estimated that around 1400 Near Earth Asteroids with a diameter greater than one kilometer cross the Earth's orbit around the Sun. These asteroids are easy to be reached from the Moon. Some of these asteroids are dead comet with large amount of water; other contain vast amount of iron.

III. Is there a need for a dedicated legal regime to govern the exploitation of extraterrestrial resources? The analysis of the Outer Space Treaty and the Moon Agreement

Preliminary considerations

As mentioned in the previous introduction, the main reason to explain the fact that States and private operators have not started to exploit the resources of the Moon and other celestial bodies yet is the absence of rules setting out how this exploitation shall be carried out. The space law system, indeed, does not provide any specific rule, relating to the exploitation of extraterrestrial resources, which have been generally accepted by States. In order to understand the causes of this absence and the need for setting up a legal regime to govern the exploitation of extraterrestrial materials, it is necessary to analyze the provisions of two space law instruments which are of particular relevance for the purpose of our analysis, the 1967 Outer Space Treaty (OS T)[4] and the 1979 Moon Agreement[5].

As a starting point of my reasoning, I may say that these two instruments

4) Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, (usually referred as Outer Space Treaty), London/Moscow/Washington,signed on 27 January 1967, 610 UNTS; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).

5) Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, signed on 18 December 1979, 18 ILM 1434; 1363 UNTS 3.

do not offer an adequate legal framework which is able to ensure the safe, orderly and peaceful development of the resources of the Moon and other celestial bodies. On one side, the Outer Space Treaty does not contain any mention of space resources or to their possible exploitation. On the other side, the Moon Agreement, whose main purpose is to set forth rules aimed at regulating the use for scientific and commercial reasons of lunar and other celestial bodies' materials, has been rejected by the majority of States, comprising the space-faring States[6]. As a consequence, its principles lose relevance when applied to the exploitation of extraterrestrial resources.

Having said that, it is already rather intuitive to understand the inadequacy of the urgent need for establishing a legal regime to govern the exploitation of the natural resources of the Moon and other celestial bodies.

Specific problems of the Outer Space Treaty

The Outer Space Treaty is usually referred as the "Magna Charta" of space law. It establishes fundamental principles applicable to all activities to be carried out in outer space, such as the freedom of exploration and use of outer space for all States, the exploration and use of outer space for the benefit of all countries, irrespective of their degree of economic and social development, and the non-appropriative nature of the space environment. The importance of the OST relies on the fact that its provisions have received general acceptance, comprising that of the major space powers[7].

As mentioned in the previous paragraph, the major problem of the Treaty is that it does not contain any specific reference to space resources and to their exploitation.

Fist of all, the Treaty never mentions "space resources". This absence has

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6) The refusal of the developed States to ratify the Moon Agreement was largely due to the insertion of the Common Heritage of Mankind idea in Article XI of the Agreement declaring the Moon and its resources to be "the Common Heritage of Mankind", see C.Q.Christol, "*Important concepts for international law of outer space*", in Proceedings of the Fortieth Colloquium on the Law of Outer Space, (1997), p. 73; F.G.von de Dunk, "*The dark side of the Moon: public concepts and private enterprises*", in Proceedings of the Fortieth Colloquium on the Law of Outer Space, (1997), p. 121.

7) As of January 2008, 98 States, comprising the space-faring countries, have ratified the Treaty.

generated debates among legal scholars about the extent to which the Treaty's principles are applicable to the extraction and use of the extraterrestrial resources[8].

Another problem of the OST concerns the term "exploitation". The Treaty, indeed, never mentions this term and, instead, it only employs the word "use". Generally speaking, to exploit means to use a certain thing for commercial purposes, namely to get a profit from it. The questions, then, that we have to ask ourselves are: what does the use of space environment mean? May the term "use" contained in the OST be considered as a synonym of "exploitation"? Does it encompass commercial use?

Considering the fact that the OST does not define the term use, one possible way to answer to the first question consist of analyzing the *traveaux preparatoires* of the Treaty in order to see whether or not the interpretation of the term use was debated by the representatives of States. Unfortunately, such approach is not very helpful. The meaning of the word "use", indeed, was not debated during the negotiations of the Treaty and the text of Article I, par. 1, which contains such word, was accepted without any problem. This absence of a debate on how to interpret the term "use" does not represent a surprise to me. When the OST was negotiated, indeed, it was impossible to foresee the development of space technologies and all the opportunities to use outer space. What it is important to point out here is that the lack of any definition of the word "use" has not prevented States and privates operators from utilizing outer space for the most different purposes ranging from the scientific to the pure commercial ones[9]. The point which is relevant for my

8) One of the most debating topics has been whether or not the prohibition to appropriate outer space set forth in Article II of the OST entails also the ban of appropriating its resources. In this respect, two ways of thinking exist: on one side, there are those authors holding that the prohibition of Article II applies equally to outer space and the resources contained thereof. See in this respect Gorove, "*Limitations on the principle of freedom of exploration and use in outer space*", in Proceedings of the 13st Colloquium on the Law of Outer Space, (1970), p. 174 and Cocca in Report of the 54th Conference of the International Law Association (1970), p. 434. On the other side, there are other authors arguing that the appropriation of natural resources merely formed part of the freedom of exploration and use of outer space, established in Art. I, par. 2 of the OST. Members of this second group are: Goedhuis, Pépin, Hodsford in ILA Report (1970), *op. cit. supra.*

reasoning is that nowadays the expression "using outer space" it is generally accepted to mean not only "to use" outer space for explorative or scientific purposes but also for commercial and profit-oriented ones. Therefore, the term "use", which is included in Article I par. 1 of the OST, has to be understood as also meaning "commercial use". In this respect "use" may be considered to be a synonym of exploitation[10]. If we accept such a broad interpretation of the term "use", it is rather logic to understand its consequences for the issue of the possible extraction and exploitation of outer space mineral resources. According to such an interpretation, the right to freely use outer space, which is laid down in Article I, par. 1 of the OST, has, indeed, to be interpreted as also comprising the right to use space resources.

In my opinion, then, the crucial point is not whether or not the exploitation of extraterrestrial resources is allowed but for which purpose and according to which rules it may take place. From a theoretical point of view, extraterrestrial natural resources can be used for two purposes: scientific or non-scientific (commercial). The former refers to the extraction and study of extraterrestrial samples for purely scientific reasons only[11]. The latter has as a primary objective to obtain an economic profit form the utilization and

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9) In the last forty years, for instance, hundreds of satellites of different nature (i.e. remote sensing satellites, telecommunication satellite) have been launched into orbit and the physical characteristics of outer space have been used to perform scientific experiment.

10) The fact that the OST does not use the term "exploitation" while, for instance, the Moon Agreement does so, may not be used as an argument to refuse the interpretation of "use" in the sense of "exploitation". When the OST was drafted, the future developments of space technologies and their applications were not possible to be foreseen. On the contrary, when the Moon Agreement was under discussion States were already aware of the fact that sending astronauts to the Moon was possible and that the extraction and utilisation of lunar mineral did not represent an unthinkable perspective anymore. Therefore, they agreed to insert the term "exploitation" in the text of the Agreement and they reached a general consensus on the fact the lunar and other celestial bodies' resources could be exploited. Therefore, a possible refusal of the interpretation of the word "use", contained in the OST, in terms of "exploitation" based on the consideration that the Outer Space Treaty does not specifically uses this term while the Moon does so has to be rejected.

11) For instance, to enlarge our knowledge about the composition of the lunar soil or to support a permanent scientific facilities on the Moon.

commercialization of such resources. The next paragraph will analyze how the OST and the Moon Agreement deal with the use of space resources for scientific and non-scientific purposes. Such analysis will be of fundamental importance to comprehend the need for a legal regime to govern the commercial use of the natural resources of the Moon and other celestial bodies.

The use of lunar and other celestial bodies' resources for scientific and non-scientific purposes in the Outer Space Treaty and the Moon Agreement

As discussed above, the use of natural space resources may be carried out for two purposes: scientific and commercial.

There is a general consensus on the fact that the use of lunar and other celestial bodies' resources for scientific reasons is allowed. Although the Outer Space Treaty does not contain any specific reference to it, it lays down the freedom of scientific investigation in outer space (Article I, par. 3)[12]. This provision has been interpreted by the United States and the Soviet Union as providing the right to remove and bring back to Earth lunar samples in order to analyse their nature and composition. It is relevant that no States made objections towards such actions[13]. Moreover, the Moon Agreement clearly establishes the right to use lunar resources for scientific reasons by confirming, thus, the above-mentioned interpretation of the provisions of the Outer Space Treaty[14].

The problems come out when dealing with the use of extraterrestrial

12) Article I, par. 3 of the Outer Space Treaty states that: "*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*".

13) See in this respect G. Gal, "*Acquisition of property in the legal regime of celestial bodies*", in Proceedings of the Thrity-Ninth Colloquium on the Law of Outer Space, (1996), p. 45

14) See Article VI of the Moon Agreement establishing that: "*In carrying out scientific investigation and in furtherance of the provisions of this Agreement, the States Parties shall have the right to collect on or 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 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*".

materials for non-scientific reasons. The Moon Agreement contains specific provisions in this respect which, however, are not so relevant due to the absence of ratification of the Agreement by the major space powers[15]. The Outer Space Treaty does not refer to the use of space resources for non-scientific purposes. As a consequence, legal authors have highly debated about the feasibility and legality of such an option. Some of them strongly refuse it[16]. Others, by making an analogy with the rules regulating the freedom of high seas, argue that the use of space resources for commercial purposes merely forms part of the freedom of exploration and use of outer space[17]. I agree with this second theory. According to Article I and II of the OST, outer space is a *res communis omnium*. Therefore, while on one side, it is not appropriable by anyone, on the other it is open for free exploration and use by all. States and private operators are entitled to use its resources so long as their activities do not involve any claim over outer space areas and until such activities do not prevent other to do the same (Art. IX of the OST). States and private operators, additionally, have also to comply with the principle that the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries (Art. I, par. 1 of the OST).

Having stated that, however, the legal problems related to use of outer space resources for commercial purposes are not completely solved. At this point of the analysis, indeed, we have to ask ourselves some questions which are of fundamental relevance for the purpose of this paperr. 1) Are the existing principles and rules of space law sufficient to ensure the peaceful and

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15) See Article XI of the Moon Agreement

16) Gorove "*Limitations on the Principle of Freedom of Exploration and Use in the Outer Space" Benefits and Interests*", in Proceedings of the 13th Colloquium on the law of Outer Space (1970), p. 174., Cocca *Report of the 54th Conference of the International Law Association* (1970), p. 434; also UN Doc.A/AC.105/C.2/L.71. Markov, ILA Report, *op. cit.*, p. 411.

17) Goedhuis "*Some recent trends in the interpretation and the implementation of the rules of International Space Law*", 19 Columbia J. of Transnational L. 213, 219 (1981); Christol, "*Article II of the Outer Space Treaty Revisited*", 9 Annals of Air and Space Law 217 (1984).

orderly development of the exploitation of outer space resources? 2) Or, on the contrary, is there a need for a specific legal regime dealing with it?

My opinion is that a specific legal regime needs to be set up. The fact is that the principles contained in the OST are of very general nature. They do not contain any explanation of the terms used and they do not clearly indicate how the exploration and use of outer space should take place in practical terms[18]. This point generates confusion and uncertainty about their content and applicability not only among legal scholars but also, and this is worse, among space operators.

Thus, considering their limits and vagueness, I seriously doubt that the commercial exploitation of outer space resources may be based upon them only. The exploitation of extraterrestrial materials represents a fascinating as well as complex venture. It raises several specific legal issues, such as those related to the right of mining extraterrestrial sites or to property rights over the extracted materials, which may not be properly dealt with and solved by simply relying on the existing space law principles. This does not mean that these principles will not be applicable directly or indirectly to the exploitation of space resources. It only means that they need to be supplemented and enlarged with specific rules addressing all the foreseeable scenario and legal problems which may emerge in the course of these exploitative activities. Therefore, my conclusion is that a legal regime establishing rules to regulate the exploitation of outer space resources must be set out.

The importance of establishing a legal regime to govern the exploitation of extraterrestrial materials, however, is not shared by all. The majority of private operators, indeed, do not see the need for such a legal regime[19]. In their opinion, it will increase the cost of the exploitative activities, it will

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18) For instance the Outer Space Treaty does not explain how outer space can be used for the benefit of all or what "province of all mankind" means.

19) Benson, "*Space resources: first come first served*", in Proceedings of the 41st Colloquium on the Law of Outer Space (1999), p. 46. See also Cunningham "*Space commerce and secured financing-New frontier for the U.C.C*", 20 Bus Law 803 (1985); Dinkin, "*Property rights and space commercialisation*", in The Space Review, at http://www.thespacereview.com/article/141/1; see also at Lunar Embassy website:http://www.lunarembassy.com/

delay their beginning and, eventually, it will prevent these activities to take place.

I disagree with such a view, although I understand the reasons behind it. Private operators have all the interests in having unclear rules dealing with the exploitation of space resources. They want to try to take advantage of this uncertainty and to get the larger possible profits from it. Nevertheless, they do not foresee the risks incorporated in such an approach. Without detailed rules on the exploitation of extraterrestrial materials, it is difficult to imagine how such exploitation could be organized. For instance, who will be entitled to exploit the natural resources of a lunar site? For how long? Who will have property rights over the extracted materials? How it will be possible to keep in force the non-appropriative nature of outer space? These questions will remain unsolved and the only possible result will be an increasing tension among the subjects involved in such activities and also a high risk of conflicts among them. This is a situation which has to be avoided. Therefore, a legal regime to manage the commercial use of space resources has to be drafted.

IV. An international regime to govern the exploitation of extraterrestrial resources

General characteristics

The exploitation of the natural resources of the Moon and other celestial bodies offers several opportunities of development for all mankind. Therefore, it is important that the legal regime aimed at governing such exploitation contains provisions allowing all people to benefit from it. When creating such a legal regime, indeed, we must never forget that that Article I of the Outer Space Treaty clearly sets forth that the use of outer space shall be carried out for the benefit and in the interests of all countries, irrespectively of their level

of development. As a consequence, feasible solutions and specific rules, which are able to guarantee that all States can benefit in a way or in another from the exploitation of extraterrestrial resources, need to be set up.

This, however, does not mean that the legal regime has to require the mandatory sharing of benefits or technology. This type of mandatory requirements have been historically proven to be unacceptable by developed States and thus is no longer worth to keep proposing them as feasible option to be applied to the management of common areas and the resources contained therein[20]. On the contrary, I think that when developing a legal regime to govern the exploitation of outer space resources a realistic approach must be adopted. The preliminary step in this respect is to wonder what is the essential element required to ensure the success and realisation of such exploitation.

In my personal opinion, this element is the full and active participation of private operators as well as space faring nations in the exploitative activities of the lunar and other celestial bodies' resources. Without their financial support and their technical expertise, indeed, these activities will never take place. Therefore, it is necessary that the legal regime contains provisions which are able not only to protect the interests of private operators and developed States but also to ensure them with the real possibility to have a return of the investments they made to carry out exploitative activities in outer space.

Another important element is represented by the ability of the legal regime to strike a balance between overregulation and inadequate regulation. Too much bureaucracy and ruling will discourage a potential enterprise to undertake exploitative activities. Too vague or limited regulation may fail to provide a proper legal environment for the development of the commercial use of lunar and other celestial bodies' resources.

Thus, summarizing, I may say that the legal regime to govern the

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20) See in this respect the refusal of developed States to accept Part XI of the 1982 Law of the Sea Convention requiring the mandatory sharing of the benefits derived from the Area and Article XI, par. 7 of the Moon Agreement containing a similar requirement.

exploitation of outer space resources would be successful only if it would be able to reach an equilibrium between the need for ensuring the respect of the existing space law principles, such as those requiring the use of outer space for the benefit of all and the respect of the non-appropriative nature of the space environment, and the need for creating incentives to stimulate the involvement of private operators in such exploitation.

Structure of the legal regime

After having pointed out the importance of setting up a legal regime to govern the exploitation of space resources, the next step consists of answering a fundamental question: how such a regime should be organized? Answering this question requires to take into consideration that the largest part of lunar and other celestial bodies' resources consists of minerals. In order to be used these minerals need to be removed from their original location first. Thus, it is realistic to anticipate that the exploitation of these mineral resources will take place in a three-phase process: 1) pre-mining phase; 2) mining phase; 3) post mining phase.

As a consequence, I think that in order to be properly structured the legal regime should establish how these three phases have to be organized and what principles and rules are applicable to all of them. In this way, space operators will be aware of the legal framework which is in force during the whole period in which the exploitative activities are taking place. This fact not only will contribute to spread certainty among these operators by stimulating them to invest in these activities but also will prevent the upraise of disputes because it will be clear since the beginning what actions and behaviours are allowed and what others are prohibited.

V. Legal nature of the legal regime to regulate the exploitation of extraterrestrial resources

The rules regulating the exploitation of the resources of the Moon and other celestial bodies should be inserted in a legal instrument which will be opened for acceptance by State and International Organizations. This instrument will take the form of a treaty or agreement among States. Despite the fact that some of the space-faring States, particularly the United States, have declared their lack of interests in negotiating a new space treaty, in my opinion to create a legal instrument containing rules to govern the exploitation of the resources of the Moon and other celestial bodies represents the only solution to ensure its enforceability and to oblige States to respect it while operating in outer space[21].

The Agreement regulating the exploitation of extraterrestrial resources should have a flexible nature and should contain a mechanism for reviewing its provisions. The ratification of the Outer Space Treaty, the Liability Convention and the Registration Convention is a pre-requisition for entering into the Agreement.

VI. Purpose and principles of the legal regime

The main purpose of the legal regime is to facilitate, manage and control the exploitation of the lunar and other celestial bodies' resources.

The legal regime proposes to set up an International Space Authority (ISA) provided with the power to organize and direct this exploitation.

The exploitation of extraterrestrial resources will be subordinated to the obtainment of a license enabling a person, both of public and private nature, to do so. In order to receive a license a subject has to submit an exploitative

21) In this respect, proposing an instrument such as a United Nations General Assembly would not be appropriated. Despite having a high political impact, its legal value is not comparable to that of an international agreement. Indeed, in the event a State fails to respect its provisions it will not commit a wrongful act and it will not be internationally responsible towards the other Parties of the Declaration.

working plan to the ISA. ISA will provide the license in case the plan furnish guarantee that the exploitative activities will be carried out in would be carried out in accordance with the existing space law principles and with rules set out in the present legal regime. The license will make clear that the licensee has the right of continued use over the area object of the license and that he can gain property rights over the extracted materials.

However, as a counter-balance measure, the license will indicate how the activities within the area will benefit all countries in order to fulfil the requirements set up in Article I of the OST.

In order to be complete and able to ensure the peaceful and successful of the exploitative activities, the legal regime will propose provisions regarding: 1) liability cases arising from such activities; 2) the setting up of a dispute settlement mechanism; 3) and the use of outer space for the benefit of all.

The next paragraphs will be organized as follow: the first part will deal with the powers of the ISA; the second part will establish rules applicable to the whole range of activities which the exploitation of extraterrestrial resources will consist of; the third part will focus on issue such as liability, the establishment of a dispute settlement mechanism, and the need for ensuring the use of space resources for the benefit of mankind.

Part I. Institutional part

The International Space Authority

Why establishing an International Space Auhtority?

Article II of the OST states that: "*outer space, including the Moon and other celestial bodies, is not subject to national appropriation, by claim of sovereignty, by means of use or occupation, or by any other means*". The text of Article II was the result of a process, which started in the early 1960's, aimed at conferring outer space the status of *res communis omnium*, namely a thing open for the free exploration and use by all States but not possible to be appropriated. Since the beginning of space activities, indeed, States agreed on renouncing to any possible sovereignty and appropriative claim over outer

space or any of its parts in order to maintain it a peaceful environment and to promote and support international cooperation in its exploration and use. Thus, if we consider that the decision to refrain from claiming sovereignty in outer space was made by all States acting collectively, it is rather intuitive to affirm that only all States acting collectively are entitled to confer the right to exclusively use an area of outer space and to obtain property rights over the resources extracted and the benefits generated thereof. Therefore, the sole organization which can represent all States and which can provide a license to carry out the exploitation of outer space resources is an International Space Authority (ISA).

The International Space Authority

The ISA is the international organization through which States manage and control the exploitation of the natural resources of the Moon and other celestial bodies.

The Authority has the power to authorize persons to exploit for commercial purposes a certain lunar or other celestial bodies' area. At the same time, however, the Authority has the duty to control that the exploitative activities are carried out in accordance with the space law principles and in a not detrimental manner for the space environment.

The Authority operates through its organs, namely the Assembly, the Council, and the Technical and Legal Committee. Special Sub-Committees aimed at supervising and controlling the implementation of a license may be established as well.

The ISA holds and represents the interests of all countries with regard to the exploitation of outer space resources. Therefore, its decisions are moved by the idea that all States should benefit from it. This, however, does not mean that the special interests of the countries which have the technologies to exploit extraterrestrial resources and which, actually, perform such exploitation are not taken into particular consideration. Indeed, the decision-making mechanism of the organs of the Authority, especially that of the Council, give to the developed States a weight which is proportioned to their impact in the exploitative activities.

The Assembly

The Assembly gives "voice" to mankind. The participation in the works of the Assembly is, indeed, open to all States which have accepted the present legal regime and which are member of COPUOS.

The Assembly meets in regular annual meeting. Special meeting can be convened upon request of the majority its members for urgent issues such as the protection of the space environment or to the implementation of the legal regime.

The Assembly adopts general policies applicable to the exploitation of lunar and other celestial bodies' resources. These policies intend to make sure the compliance of the exploitative activities with the space law regime and their safe development[22].

Apart from adopting general policies applicable to the exploitative activities, the Assembly has the power to: 1)Elect the members of the Council; 2) Elect the member of the Technical and Legal Committee; 3)Elect the members of the Special Sub-Committee; 4)Recommend the Council the adoption of urgent measures to protect the space environment; 5)Recommend the Council the adoption of measures to implement the purposes and policies of the legal regime; 6)Asses the contribution of States to the budget of the Authority and submit to the Council the annual budget of the Authority[23].

annual budget of the Authority.

The Assembly shall also establish a registry in which all the data regarding exploitative activities of extraterrestrial resources have to be maintained. Each

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22) When adopting these policies particular focus is paid on the need for protecting the space environment, for promoting international cooperation, for enhancing the exchange of information, and for preserving the peaceful nature of outer space.

23) The financial budget of the ISA is provided in two ways: 1) by a voluntary contribution of the participant States 2) by the initial fee paid to obtain a license to exploit an extraterrestrial site. With regard to the voluntary contribution, when becoming part to the legal regime, States will accept the obligation to provide the Authority with a certain amount of funds proportioned with their GNP and their financial contribution to the United Nations. As to the use of the initial license' fee, it will be explained later that in order to get a license to carry out the exploitation of extraterrestrial resources, a person will have to pay an initial fee and fees every five years.

subject who has received a license to carry out such activities shall provide information regarding its mission within one month from its starting. Moreover, he should provide information on the status of his mission on an annual basis in the form of a report.

Decisions of the Assembly are taken, as a general rule, by consensus. Each participant State expresses one vote. If all the efforts to reach a decision by consensus have been exhausted, a decision shall be taken by a two-third majority of participants present and voting.

The Council

The Council is the main organ of the ISA. Its functions and powers represent the core of the system regulating the exploitation of the mineral resources of the Moon and other celestial bodies.

The principal functions of the Council are: 1) To provide a license to carry out the exploitation of the natural resources of the Moon and other celestial bodies. The decision of the Council takes in due account the recommendation of the Technical and Legal Committee regarding the need for accepting or refusing the proposed exploitative plan. 2) To supervise and control the licensed activities[24]. In case the licensee does not respect the terms of the license, this can be suspended or revoked. 3) To adopt the annual budget of the Authority on a proposal of the Assembly. 4) To give the Authority directions for the adoption of general policies related to the exploitation of lunar and other celestial bodies resources. 5) To adopt urgent measures for the protection of the outer space environment. 6) To propose the Assembly a list of candidates for the Technical and Legal Committee. 7) To establish a special sub-Committee in case an emergency related to the protection of the space environment or to significant problems in the implementation of an exploitative plan arise. The special sub-Committee should be composed by 10 experts elected on a proposal of the Legal and Technical Committee. The special sub-Committee should produce a report on the issue it has been

24) Detailed information on how this control procedure will take place will be provided in the part dealing with the concession of a license to carry out exploitative activities in outer space.

established for and should advise the Council on the measure which need to be taken.

The participation in the works of the Council is not open to all States members of the Assembly at the same time. The Council should consist of 20 members of the Authority elected by the Assembly every five year in the following order: 1) Four members from among those States which, during the last five years for which statistics are available have invested at least 0.5 billions of dollars per year in space activities. 2) Six members from among those States which, during the five years for which statistics are available, have made the large investment in space activities and, in particular, in projects aimed at exploring and exploiting lunar or other celestial bodies 'sites. 3) Five members from among developing States representing special interests[25]. 4) Five members elected in accordance with the principle of ensuring equitable distribution of seats of the Council as a whole. One geographical area has to have at least one representative[26].

Decisions are taken by consensus. If consensus cannot be reached, the Council will decide by a majority of the members present and voting, provided that such majority includes a majority of the members of the Council.

The Council meets regularly on an annual basis. Special meeting may be held upon a request of the majority of its members.

The Technical and Legal Committee

The technical and legal Committee consists of 16 members elected by the Assembly on a proposal of the Council.

Members of the Committee shall have recognized qualification in the area of competence of the Committee so as to ensure its proper and efficient functioning.

The principal task of the Committee is to review and analyse the

25) These interests to be represented shall include those States with large populations, States which are major importers of the minerals which are expected to be derived from the Moon and other celestial bodies, and States which are potential producers of such minerals.

26) The five areas are: Africa, Asia, Latin America, Western and Eastern Europe.

exploitative plans. The Committee will evaluate the feasibility of the proposed activities both from a technical and legal point of view[27]. At the end of the reviewing procedure, the Committee will formulate and submit to the Council its final opinion concerning the proposed exploitative plan. The Committee will recommend the Council: a) to approve the plan as a whole; b) to approve the plan with the suggested amendments; c) to reject the plan.

The rule for taking decision within the Committee is by consensus. If all the efforts to reach consensus have failed, the Committee would deliberate by majority of 2/3 of its members.

The Committee also reviews the annual report which each licensee is obliged to submit at the end of every year in order to provide information on the status of his exploitative activities. The Committee expresses the Council its opinion on the report.

Furthermore, the Committee is entitled to suggest the Council a list of experts for the composition of the special sub-Committee in case the Council considers its establishment to be required.

The Committee meets twice per year[28].

Part II. The exploitation of lunar resources: applicable rules and licensing procedure

Before being entitles to exploit the resources of a lunar or other celestial bodies' site, a subject must undertake certain activities and follow a number of legal requirements and procedures.

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27) The technical experts of the Committee examine the quality, nature and typology of the technologies and structures which are expected to be used and built when exploiting an extraterrestrial site. The expected impact of these technologies and structures on the space environment represents a central part of this analysis.
The legal experts focus on the compatibility of the proposed exploitation of extraterrestrial resources with the space law regime. They have to point out the inconsistencies and deficiencies contained in the proposal and recommend the due amendments.

28) One of the two sessions shall take place one month before the meeting of the Council in order to communicate the opinion on the proposed exploitative working plan.

The first step is represented by the exploration of an extraterrestrial area[29]. Following this exploration, a subject would begin the procedure leading to the obtainment of a license. This procedure would consist of several phases in which the organs of the International Space Authority would play a different as well as complementary role.

The exploration of an extraterrestrial site

Exploring an extraterrestrial site does not require any specific authorization provided by the ISA. The right to freely explore outer space, comprising the Moon and other celestial bodies, is clearly sets out in Article I, par. 2 of the Outer Space Treaty which reads: "*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*". Being a *res communis omnium*, indeed, outer space is open for free access and exploration by all States parties to the Treaty. Additionally, Art. I, par. 3 of the OST establishes that States have freedom of scientific investigation in Outer Space. This concept is further elaborated in Articles VI and IX of the Moon Agreement stating that States Parties in the course of their scientific investigation of the lunar surface and subsurface may collect and remove Moon samples or its minerals and may establish manned and unmanned station on the Moon[30].

The main point, thus, is that States do not need any authorization to explore outer space or any of its parts.

A slightly different approach applies to private operators. Indeed, in accordance with Article VI of the OST, such operators need to receive an authorization to operate in outer space from their national State. The

29) Such an exploration would provide essential information regarding the nature of that area and the presence of valuable resources thereof.

30) Through the years, States have made use of their right to explore outer space. For instance, between the late 1960's and early 1980's, the United States and the Soviet Union have performed scientific investigation of the lunar soil and have brought back to Earth Moon samples. These activities have been carried without receiving a specific permission for doing so and, significantly, the other States Parties to the Outer Space Treaty have not raised any complaint regarding their legality.

characteristics and terms of a license are to be decided at national level by the licensing State. Anyway, from a general point of view the licensee shall commit himself to respect the space law principles, to protect health, safety, national and foreign interests of its national State and has to obtain liability insurance or to show financial responsibility to cover damages to third parties resulting from its activities. Following the concession of a license, the licensing State would be considered to be responsible for the activities of its nationals and liable for the damages to third parties which can be produced as a result of such activities.

It is important to point out that the exploration of a lunar site confers any proprietary title over the discovered resources. Exploring outer space is one of the rights provided by the OST to space operators; however, this does not mean that the explorer can get property rights over the materials he has discovered during the explorative activities he has carried out. If a subject was allowed to do so, this would represent a violation of the non-appropriative nature of the space environment. The only way to get property rights over lunar and other celestial bodies resources would e by means of a license provided by the International Space Authority enabling a subject to do so.

Furthermore, it may be added that the exploration of an extraterrestrial site does not confer to the explorer any priority title for obtaining a license to exploit that site. The license, indeed, is provided by the ISA on the basis of the quality and feasibility of the proposed exploitative plan.

Application procedure

Once concluded the exploration of a lunar or other celestial bodies' site, the explorer would begin the procedure to obtain a license to exploit that site. This procedure would consist of three phases: 1) submission of the exploitative working plan; 2) review of the plan; 3) concession of a license. Each of these phases shall last a pre-determined period of time.

Each subject which submits an exploitative working plan is defined by the present legal regime as an applicant. Applicants may be States, private operators, Intergovernmental Organizations.

Private operators shall be sponsored and licensed by their national State. The sponsoring State shall, in accordance with article VI of the OST, authorize and supervise the activities of its nationals in outer space.

An exploitative working plan should contain the following elements: 1) a report on the exploration conducted by the applicant on an extraterrestrial site; 2) a detailed plan of the exploitative activities that the applicant is willing to carry out on a lunar site containing information on the geographical location of the site, the duration of the activities, the expected results, the technologies to be used, the production methods; 3) measures to protect the space environment; 4) strategies and plans to fulfill the requirement of Article I of the Outer Space Treaty requiring the exploration and use of outer space to be carried out for the benefit of all countries.

Review of the plan

Upon receiving the plan, the Council would forward it to the Technical and Legal Committee to be analyzed. At the end of its analysis, the Committee would communicate its opinion to the Council by recommending: 1) to approve the plan as it has been presented by the applicant; 2) to approve the plan under the condition that the amendment proposed by the Committee are accepted; 3) to reject the plan.

The Committee would have 45 days to review the plan and to send its opinion to the Council. The Council should use the opinion of the Technical and Legal Committee as a basis for its final decision regarding the concession of a license. Anyway, it will make its own analyze of the exploitative working plan. The Council would have one month to reach its decision about the granting of a license. At the end of this period the Council may concede the license or ask the applicant to introduce certain changes in the proposed plans. The applicant would have two months to comply with these changes and to submit the amended plan. The Technical and Legal Committee would have then 20 days to review the revised plan and to send to the Council its opinion. The Council then would meet in a special session and would make its final decision regarding the concession of the license on behalf of the International Space Authority.

The license

The license to carry out the exploitation of the resources of a lunar or other celestial bodies' site is a contract between the Authority and the licensee.

The license will contain: 1) a declaration of the licensee accepting the space law principles and the rules of the present legal regime and affirming his duty to operate in good faith; 2) the indication of the geographical location of the extraterrestrial site object of the license; 3) the schedule of the activities to be undertaken on the lunar site. These activities will have to last a pre-determined period established in the license. 4) Measures and technical guarantee for the protection and preservation of the space environment; 5) measures for ensuring the access to the area object of the license; 6) the plan indicating how the exploitation of extraterrestrial resources will benefit all mankind; 7) acceptance of the dispute settlement mechanism sets out by the present legal regime; 8) acceptance of the liability regime established by the present legal regime

The Authority, by means of the Council, has the duty to control the operate of the licensee[31]. In case such a control shows that licensee has not respected the terms of the license, the Council would ask the licensee to stop these violations and to take the required measures. It will have 2 months time to do it. In case nothing happens or the adopted measures are not considered adequate by the Council, the Council itself may decide to suspend the license. In a similar situation the licensee would have one month to comply with the request of the Council. Delay may be accepted only for sensible reasons. If the actions taken by the licensee are considered not sufficient or if he has simply ignored the requests of the Council, the license may be revoked.

The license would be given for a maximum period of twenty years. This is an essential for ensuring the compliance of the legal regime regulating the

31) The Council will have two ways to verify if the licensee is operating in accordance with the license: 1) through a report which every license is obliged to provide on an annual basis containing information on the activities which have been undertaken; 2) through a manned mission which can check in loci the status of the exploitative activities. The Council should give the licensee one month notice before undertaking the control. The licensee shall offer proper collaboration and provide information during the control

exploitation of extraterrestrial resources with the non-appropriative nature of outer space sets out. The license, indeed, would provide a temporary right to use a certain space area. However, no sovereign right over that area would be granted along with the license.

At the end of the twentieth year, theoretically the site object of the license would be put again on the market and, thus, available for other users. In order to use this site a new application procedure will be required. Application will be analyzed on a first come basis. The former licensee will have to submit a new application procedure as well in case he intends to keep operating in that site. The Council will provide the license on the basis of the quality of the proposed exploitative plan. However, in case the former licensee presents has submitted a proposal for that site, the Council will have to take in due consideration whether or not the licensee has well operated when carrying out exploitative activities and facilitate the renewal of its license.

The obtainment of the license will be subject to the payment of an initial fee. The licensee will have also to pay a fee every five years. Additionally, in case he does not comply with certain terms of the license a fine can be imposed.

The licensee enjoys two rights for the whole duration of the license: the right of continued use over the area object of the license and the right to exercise property right over the extracted materials and the benefits generated thereof. The right to continuously use a certain lunar area does not mean appropriation of that area. It is a mean to protect and secure the investments and activities of the licensee. Property rights over the extracted resources are necessary in order to provide the licensee with a reward for the effort they made to explore and exploit a lunar site and to make such exploitation a profitable business.

Along with these rights, however, the licensee will have strict duties. Primarily, he will have the duty to fully comply with the terms of the license, unless reasonable and provable reasons exist. In case the licensee fails to operate in accordance with the license, the Authority, by means of the

Council, may decide to suspend the license. In such an option the Council will recommend the licensee the measures to be taken in order to fulfill with the violated contractual conditions. The licensee will have three months to do so. In the event he fails to do so, the license can be revoked and the lunar site object of the license will be put on the market again. The licensee will have a certain period of time determined by the Council to leave that lunar site. In case of violation of the conditions established in the license, the Council may also decide to impose fines on the licensee.

Part III. Liability regime applicable to the exploitation of extraterrestrial resources

The legal regime to regulate the exploitation of extraterrestrial resources requires rules coping with liability issues. Such rules will be based on the provisions of the 1972 Liability Convention[32]. However, the scope and applicability of some of these provisions need to be extended in order to cover liability cases which are not addressed by the Convention, such as cases of damages caused to the space environment.

Applicability of the Liability Convention

The Convention establishes that a launching State is liable for damages caused by its space object. In order to see if the Liability Convention is applicable to liability cases arising from the exploitation of the resources of extraterrestrial sites, we have to answer to the question whether or not a station built on the lunar surface with the purpose of exploiting the resources contained thereof is a space object. In case of positive answer, indeed, the provisions of the Liability Convention become relevant for damages arising from extraterrestrial exploitative activities. In a contrary case, a specific liability regime has to be set up.

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32) Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), done on 29 March 1972, 961 UNTS 187; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965.

The definition of space object is provided by the Liability Convention. According to Article I (d): "*a space object includes component parts of a space object as well as its launch vehicles and parts thereof*". The 1975 Registration Convention[33] repeats this definition in its Article I, (b) by expanding thus the scope of Article VIII of the OST, which establishes that a State on whose registry an object launched into outer space is registered shall retain jurisdiction and control over such object. Therefore, as far as jurisdiction and control are concerned, a "space object" is an object launched into outer space. as to be created[34].

Although neither the Liability Convention nor the Registration Convention define a space station as a "space object" in my opinion this interpretation can be supported. A space station, indeed, is an object which is launched and operates into outer space. The fact that it consists of separate parts which need to be assembled in outer space, does not change the point that at the end of the assembling phase the space station would be one single space object operating on the surface of a celestial body. Therefore, once completed such a station could be legally registered as a "space object" by the launching State in accordance with the procedure sets out in the Registration Convention. This does not mean that the launching State would not have to register the components of such a station once they have been launched. It only means that when the station is completely assembled, the launching State would be fully entitled to register the space station as such within the UN Registry[35].

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33) Convention on Registration of Objects Launched into Outer Space (hereafter Registration Convention), signed on 14 January 1975, 1023 UNTS 15; TIAS 8480; 28 UST 695; UKTS 1978 No. 70; Cmnd. 6256; ATS 1986 No. 5; 14 ILM 43.

34) Prof. Kopal has expanded upon this conclusion by stating that: "*Space object should be considered any object launched by man for a mission into outer space, be it into orbit around the Earth, or beyond into planetary space to and around the Moon and other celestial bodies of the Solar system, or into deep space*", in V. Kopal, "*Some remarks on issues relating to legal definitions of "space object", "space debris" and "astronauts*", in Proceedings of the Thirty-Seventh Colloquium on the Law of Outer Space, (1994), p. 99.

35) A similar proposal was put forward by Gorbiel in 1984. By noticing a gap in the Registration Convention with regard to the registration of space station, he recommended the

For all the aforementioned reasons I consider a space station built on the surface of the Moon to be a "space object". Consequently, the provisions of the Liability Convention would be applicable in the event of damages to another space object, or on person or property on board such a space object, or to a third State and to its natural or juridical person as a result of the functioning of the space station and the working of its personnel, if a fault of the launching State can be proved (Article III, IV). A launching State would be also liable for damages caused by its space object on the surface of Earth or to an aircraft in flight. In this case fault would not have to be proven because a system of absolute liability would be in force (Article II of the Liability Convention). In case of States jointly launching parts of the station, they shall be jointly liable for any damage occurred (Article V).

In the event of damages caused by a private operator or company operating on the lunar surface, the liability for such damages will be of the national State of the operator. Accordingly with Article VI of the OST, a private entity must obtain an authorization from its State of nationality in order to be allowed to carry out space activities. After providing such an authorization the State will have the duty to supervise and control the space activities of the operator by accepting, thus, international responsibility for them

Liability for damages caused to the space environment

It is likely that when exploiting an extraterrestrial site damages to the space environment may occur. In a similar event would a State or private operators be liable for these damages? And who would be entitled to get compensation?

As we have seen in the previous paragraph, the Liability Convention only deals with liability of a launching State for damages caused on the Earth surface or to an aircraft in flight or to another State and/or its natural or juridical persons and property without containing any reference to State's

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introduction of a rule implying that when component parts individually registered by the launching States had to be assembled in outer space, such States would agree on which of them would register the whole space station as a space object following the procedure of the Registration Convention, see A.Gorbiel, "*Large space structures: the need for a special treaty regulation*", in Proceedings of the Twenty-Seventh Colloquium on the Law of Outer Space, (1984), p. 247-250.

liability for damages to the space environment. However, the possibility to consider a State liable for damages caused to the space environment may be supported by using space law, international public law and the principles of the present legal regime.

First of all I may quote Article VII of the Moon Agreement which states that: "*In exploring and using the Moon, State 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*". Although the Moon Agreement has not been ratified by the major space powers and therefore its provision cannot be considered as having binding effect, it gives us a preliminary indication that the use of the Moon must be carried out in a non-detrimental manner for the lunar environment.

Stronger argument for supporting the liability of States for damages to the outer space environment can be found in Article I and IX of the OST. Article I of the OST declares that the use of outer space shall be carried on for the benefit of all. Performing space activities which generate damages to the space environment would be a behavior in contrast with such Article. Additionally, Article IX states that while exploring and using outer space a State shall avoid harmful contamination to the space environment. In case a State causes these contaminations, such a State would violate a Treaty obligation. Having violated a Treaty obligation, such a State would commit an internationally wrongful act and, therefore, it would be internationally responsible toward the other parties to the Treaty. As a consequence, it would have to face the consequences of such act which consist in the reparation of the damages in the form of restitution and, or, compensation and, or, satisfaction. Considering the re-establishment of the situation which existed before the wrongful act was committed to be materially impossible, the most likely solution would be a monetary compensation for the caused damages. Thus, having in mind that outer space is the "province of all mankind", the State who is responsible of damages to the space environment would have the obligation to pay compensation for such damages to the other

States Parties to the OST who, vice versa, would be entitled to claim compensation for those damages.

VII. A dispute settlement mechanism

Although the purpose of a legal regime is to avoid the arising of disputes, it is probable that disputes would arise in the course of the exploitation of outer space resources. Therefore, there is the need to establish an efficient dispute settlement mechanism within the context of the legal regime regulating the exploitation of extraterrestrial materials arises.

Setting up a dispute settlement mechanism is important for two reasons: 1) without a means of settling disputes, the legal regime would become less effective because its rules could not be properly enforced; 2) international space law does not set forth any compulsory dispute settlement.

In this respect, the dispute settlement mechanism operating within the context of the World Trade Organisation (WTO), offers an interesting and successful precedent which may be applied to the legal regime governing the exploitation of the mineral resources of the Moon and other celestial bodies. The dispute settlement mechanism of the WTO, indeed, has received the worldwide acceptance and appreciation and has operated in a very successful manner so far[36].

The dispute settlement mechanism of the legal regime governing the

36) First rulings are made by a panel of experts and later are endorsed or rejected by the members of the WTO operating through the Dispute Settlement Body (DSB). Parties to a dispute may appeal the decision of the Dispute Settlement Body. The purpose of the WTO dispute settlement mechanism, however, is not to pass judgement. It aims at settling disputes, by focusing on consultations if possible. In this respect, the mechanism has been successful. By July 2005, only 130 of the 332 cased had reached the full panel process. The others have been settled "out of the Court". For an analysis of the WTO dispute settlement mechanism see: Gent, "*WTO trade disputes*", Leiden, 2006; Yang, Mercurio, Li, "*WTO dispute settlement understandings: a detailed interpretation*", The Hague, Kluwer Law International, 2005;

exploitation of the lunar and other celestial bodies should contain clear rules and flexible timetable for solving the case.

A dispute will arise when a country adopts a measure which is in contrast with the rules of the legal regime regulating the exploitation of extraterrestrial materials, or when two ore more countries disagree on the interpretation and implementation of certain provision and one of these countries acts unilaterally, and in all other cases in which the actions taken by a country prevents others States to enjoy the rights and benefits deriving from the participation in such a legal regime[37].

The dispute settlement mechanism should be based on the idea that the prompt settlement of disputes is essential for the proper functioning of the legal regime. The settlement procedure will not have to last more than 13 months.

The Space Dispute Settlement Body (SDSB) should be the organ with the power to settle disputes related to the exploitation of extraterrestrial materials. The SDSB will consist of all the States which have accepted the present legal regime. Its main task will be to appoint a panel of expert, to accept or refuse the panel' findings or the result of the appeal, and to monitor the implementation of rulings and recommendations.

The procedure will be structured as following:

- 60 days for consultations and other diplomatic means of solving disputes among the parties to a dispute. If consultations fail, the complaining country may ask the Space Dispute Settlement Body to appoint a panel of expert. The other country parties to the dispute can block the creation of the panel only once because when the Dispute Settlement Body meets for the second time, the appointment can no longer stopped
- 45 days for the DSDB to set up a panel of expert. The panel would

37) This mechanism will not cover liability cases deriving from damages caused by exploitative activities performed in a lunar or other celestial body's site. As it has been already discussed, these cases will have to be solved in accordance with the provisions of the Liability Convention and with the amendments to such Convention introduced by the present legal regime.

have 6 months to prepare the final report and to send it to the DSDB. The work of the panel will consist of: 1) first hearing: the complaining part, the respondent part, and other parts who have interest in the case, make their case and present their oral arguments during the first hearing after having submitted their memorial before the beginning of the hearing itself. 2) rebuttal: the countries involved in the dispute have the right to submit written rebuttals and present oral arguments. 3) Interim report phase: the panel submits an interim report, comprising findings and conclusions, to the two sides giving them three week to ask for a review. The review may last a maximum of two weeks. 4) Final report: a final report is submitted to the two parties and after three weeks to all participants to the legal regime. If the panel considers that the measure object of the dispute breaches the legal regime's rules or an obligation, it recommends that the measure is taken consistently with the regime. Parties are free to decide how to do so, although the panel may suggest a feasible solution.

- 60 days for the Space Dispute Settlement Body to adopt the report if no appeal is presented. The DSDB will adopt the final report unless there is a consensus to reject it

In case of appeal:

- 60-90 days for the Appellate Body to submit the appeal report. The appeal shall be based on points of law and will not have to ask for re-examining existing evidences or examining new issues. Each appeal is heard by three members of a permanent seven-member Appellate Body established by the SDSB. The members of the Appellate Body are individuals with recognized standing in the field of international public law and space law. The appeal can uphold, modify or overturn any of the panel's legal findings and conclusions. Usually appeals should last a minimum of 60 to a maximum of 90 days.
- 30 days for the Dispute Settlement Body to adopt the appeal report within 30 days following circulation of the Appellate body's report unless there is a consensus to reject it.

After the adoption of a report indicating that a country measure is contrary to legal regime governing the exploitation of the resources of the Moon and other celestial bodies, the country has to act in accordance with the recommendations contained in the report and take the necessary measures. If the country cannot immediately comply with the recommendations, it will be provided with a reasonable "period of time" decided by the SDSB.

If the losing party fails to act within a reasonable period of time, it has to negotiate with the complaining country in order to agree on mutually accepted compensation. If after 20 days, no satisfactory compensation is agreed, the complaining part may ask the SDSB authorization to impose limited sanctions. The SDSB should decide about this within 30 days of the expiry of the "reasonable period of time". In principle, the sanctions should be taken in the same sector of the dispute. If it is not possible or if it would not be effective, the sanctions can be imposed in a different sector.

VIII. The exploitation of extraterrestrial resources for the benefit of all mankind

The legal regime to regulate the exploitation of extraterrestrial resources must be able to ensure that such exploitation is carried out for the benefit of all States. The implementation of this idea, indeed, is not only required to guarantee the worldwide acceptance of the regime, especially by developing countries, but also to comply with some fundamental principles of the space law regime.

When thinking of using space resources, it has always to be kept in mind that since the beginning of space activities States agreed to deem the space era as an opportunity of development for all mankind. At that time States considered the exploration and use of outer space as a mean for correcting iniquities existing on Earth and for facilitating all people to improve their

living condition. This idea was clearly declared in Article I, par. 1 of the OST 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 or scientific development, and shall be the province of all mankind*". Thus, having in mind the importance that using outer space for the benefit of all entails within the space law system, a legal regime aimed at regulating the exploitation of extraterrestrial resources must find solutions to ensure that such an exploitation is not only a profitable business for the exploiters but also a chance of development for all States.

The question, then, is: how to organize it? The starting point of my reasoning is that mandatory mechanism obliging operators to share benefits must be avoided. This kind of mechanism have been historically proven to be unacceptable by the developed States which have considered them as reducing the return on their investment and discouraging potential participants[38]. The lesson which can be learned is that any mechanism for allowing all countries to benefit from the exploitation of space resources does not have to be detrimental to the interests of the developed States because only those States have the financial and technical capacity to perform such exploitation.

The first mechanism which can be put forward is related to the payment of a fee for obtaining a license to carry out exploitative activities over a certain extraterrestrial area. As previously analyzed, obtaining a license is subordinate to the payment of an initial fee to the ISA. The Authority may reduce the amount of such a fee in relation with the licensee's investment of its mining operations in developing countries. Thus, when applying for a licensee, a subject could indicate how he intends to invest part of what he got from the exploitation of a certain lunar area in projects aimed at improving the developing countries' situation.

This first method has the characteristics for being accepted by the

38) One of the main reasons behind the refusal of developed States to accept the provision of the 1982 Law of the Convention and the 1979 Moon Treaty was the obligation to equitably sharing the benefits generated for exploitative activities.

developed countries. Indeed, it does not contain any obligation to equitably sharing the benefits. Additionally, this method will create a huge incentive for developed countries to invest in the developing world. A substantial reduction of the initial fee may be obtained. Moreover, this method will directly benefit the developing States because developed countries will be stimulated in investing in infrastructures within the territory of the developing States.

A second method proposes to devote a certain percentage of the license's fee to the United Nations for supporting its economic and social development programmes. As it is well known, one of the central purposes of the United Nations is to promote higher standards of living, full employment, and conditions of economic and social progress and development. Since the 1960's, the United Nations has operated on a worldwide scale in order to fulfill these purposes. Through the years, the United Nations has established several specialized agencies and dedicated programs, such as the UN Development Programme (UNDP)[39], with the aim of supporting and helping developing countries.

Thus, by providing the United Nations with a larger amount of funds to be used for its development programmes, it is rather logic to foresee that developing countries will directly benefit from it.

Ⅸ. Conclusion

The exploitation of the natural resources of the Moon and other celestial bodies represents a unique opportunity of development for all mankind. The large number of benefits which can be generated from the use of these resources may encourage and contribute to the betterment of conditions of people on Earth.

Because of the lack of specific rules, the exploitation of extraterrestrial

39) Other examples of UN programmes are: the UN Children's Fund (UNICEF), the World Food Programme(WFP), the UN Environmental Programme (UNEP), etc.

resources has not started yet. Therefore, a legal regime which establishes rules aimed at regulating such exploitation and at ensuring its peaceful and safe development has to be set up.

Abstract

The exploitation of the natural resources of the Moon and other celestial bodies represents one of the most exiting future developments in the field of space law as well as a unique occasion for the economic and social growth of mankind as a whole.

The large number of benefits that are expected to be generated from the exploitation of these resources, indeed, not only will contribute to the betterment of conditions of people on Earth but also will allow mankind to face and likely solve one of the biggest problems currently affecting our planet, namely the exhaustion of the stocks of raw materials and other source of energy, such as fossil fuels.

The exploitation of the natural resources of the Moon and other celestial bodies, however, has been prevented so far by the absence of dedicated space law rules allowing its orderly and peaceful development and clarifying the rights and duties of the parties involved in it. Due to the uncertainty generated by the absence of these rules, indeed, States as well as private operators have refrained from investing in the exploitation of space resources so far.

The time to change this situation and to allow the exploitation of extraterrestrial resources to begin has finally come. This paper aims at fulfilling this purpose by proposing a legal regime containing specific and detailed rules to regulate the exploitation of the natural resources of the Moon and other celestial bodies.