

The Need to Regulate New Space Activities on Exploration of Space Resources and Off-Earth Mining

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Abstract

Natural resources beyond our planet could be exploited by private companies under title of “NewSpace” initiatives. Space mining has attracted the attention of universities and mining companies around the world, who see in it an opportunity they can benefit from. The goal of mining asteroids is an objective which demands a huge financial investment as well as the most advanced technical capabilities in order to be successful. However, the issue raises some legal questions. It remains to be seen whether private companies will legally be able to appropriate resources that, under international space treaties, and whether national space law and regulations can be approved exploitation by private companies in despite of the treaties. The legal framework which regulates this activity is equally complex. Article II of the space Treaty established 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 and Article 11.3 of the moon Agreement stated that Neither the surface nor the subsurface of the moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or non-governmental organization, national organization or nongovernmental entity or of any natural person. The international treaties are binding on both States and their nationals, and consequently space mining cannot be undertaken by companies for private gain in a way that would exclude the rest of mankind. However, the situation today is very different to when the original treaties were first enacted, and there is no specific regulation on this matter, new regulation is required to regulate and promote this activity. This article suggests that international community needs a new regulation especially about responsibility and liability for private section to promote and open up this activity. It would be advisable, when preparing any new regulations, to take into the account two similar treaties to unify regulations on private international law about activity of private section in international level, since they have been the subject of intense legal debate as both are considered to and not subject to the jurisdiction of a specific country.

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1. Introduction

NewSpace has been used to describe approaches to space development that differ significantly from that taken by the mainstream aerospace industry. In other words, NewSpace is an umbrella term for a movement and philosophy often affiliated with, but not synonymous with, an emergent private spaceflight industry. Specifically, the term is used to refer to a community of relatively new aerospace companies working to develop low-cost access to space or spaceflight technologies and advocates of low-cost spaceflight technology and policy.

We are at a turning point in the history of space exploration and development. The new industries are being born that use space in non-traditional ways. The nature of activities in outer space have largely transformed from those of the Cold-war era. Sixty years after the beginning of space exploration, the use of space is currently subject to profound and rapid changes often referred to as “New Space”.¹ These changes affect on the methods to invent and produce space equipment, the use of space data and services, and finally the increasing place of private partners in space activities, hence the established industrial space no longer the only main player in this field. Increased competition and new capabilities will change the marketplace and everyone interested in working in the space sector will be affected.²

Space mining is the commercial exploitation of natural resources in outer space, particularly from celestial bodies. Space mining is one of those ideas that science and space exploration technology have caught up with in recent years. Today, prospects of commercial space mining are a subject of human and technological marvel. Sooner or later, continued development in space mining techniques and technology, will lead to a disruption in traditional mining, similar to the one caused by the tapping of copper reserves and off-shore oil and natural gas in the last centuries. Space companies are targeting Near-Earth Asteroids, as they satisfy most of the prerequisites for commercial space mining.

Asteroids, are compared to other celestial bodies, easy to reach and are said to contain a vast amount of minerals. The claim that an asteroid’s orbital mechanics are well understood, making asteroid trajectory calculations simple, will be tested only when an actual mission to mine is undertaken. Moreover, the technology for space mining is rapidly and constantly evolving. Traditional mining technology meets space technology in the efforts to tap mineral resources in space.³

1 <https://ntrs.nasa.gov/search.jsp?R=20160001188> 2017-08-30T07:34:37+00:00Z (last Visited Sep. 2, 2017).

2 Space Access Society www.space-access.org (last Visited Sep. 2, 2017).

3 www.stardustconsulting.es/publications/article8.pdf (last Visited Sep. 2, 2017).

There are many private economic activities that are based on the use of outer space and a handful of private sectors have encouraged their Governments and the public to consider the possibility and utility in extracting minerals from celestial bodies. All such activities adhere to well defined laws and principles under international space law that have so far been accommodative of these activities. Although, the economic and technical feasibility of space mining is debatable, it is the uncertainty and inadequacies in laws that act as first impediments to interested parties. Consequently, the legal issues surrounding mining in outer space have been a topical subject of discussion in the international legal community.

The principal legal challenge is crystallized when the United States Commercial Space passed Launch Competitiveness Act (H.R. 2262) (CSLCA) by Congress in November, 2015 and signed into law by President Obama. Section amends the U.S. space law code to include a new Section 51303: “A United States citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States.”⁴

Commercial space mining is indeed a challenge to existing international space law. However, it is not a completely new concept. The physical nature of the outer space, limited knowledge, and the effect of human endeavours in such a unique environment are the factors that require careful deliberation of the issue at hand, in order to understand its compatibility with existing principles and rules. The common perception is that existing international space law does not accommodate commercial space exploitation. It has given rise to conflicting views and a call for revisiting the current space regime to establish a legal and regulatory framework to govern commercial space mining.

Many questions would arise if international community does not develop laws to govern the asteroid-mining process. These legal challenges are such as commercial space mining compatible with existing space law, the legal status of resources extracted in outer space, claiming ownership rights by commercial entities through their State, responsibility and liability for their activities, the principle of ‘non-appropriation’ in outer space, outer space belonging to the international community as a whole, sharing benefits from commercial space mining, an equitable distribution of the resources extracted or profits derived there from, requiring the new regime, the role of non-space faring nations in law making, the role of states in the commercialization of space. There are also questions as to whether space law protects private sectors against public sector as well as a private sector. In this paper, the authors try to investigate

4 H 2017/IAC 2017/H.R.2262 – 114th Congress (2015-2016) _ U.S. Commercial Space Launch Competitiveness Act _ Congress.gov _ Library of Congress.html (last Visited Sep. 2, 2017).

challenges of the legal regime of exploitation on Space Resources and Off-Earth Mining with particular reference to liability for private sector, and show that the current international regime is inadequate for determining liability of private activities in this regard and to indicate how this problem may be settled through private international law.

Although the Liability Convention 1972 provides provisions that includes liability regime for states and private sector, there are ambiguities about liability of individuals. The task of formulating space law in the 21st century is different from what international community has applied in the past years. Technological and scientific advancement has brought us to the point where mankind will have to consider its next steps in order to enable fair exploitation of Space Resources and Off-Earth Mining. Growing economic uses of space technology and the privatization is leading to the wider applications of private international law which will have to be supported by appropriate provisions on liability. With regard to the development of space technology, the private sector is willing to invest in the exploration of space, but they need that the international community supports their interests against others. It should be consider whether private companies will legally be able to appropriate resources that, under international space treaties, belong to mankind. Liability of private sector is naturally different from responsibility of states and public sector in space international law.

2. Property Right and Common Heritage of All Mankind

Privatization in space activities has brought many legal and economic considerations to the forefront. Private companies cannot be secure in the right to own them which they extract, because the existing international law on property acquired in space is vague. Private sectors cannot be sure whether their property claims will be enforced after they extract minerals in space and bring them back to Earth. When investing large sums of money such a consideration is absolutely critical. Although there has been investment in the area, sending an actual mission to an asteroid will require less ambiguous property provisions in international space law. Even if private sectors are able to mine precious resources from asteroids, it is not entirely clear that they have any ownership rights to space resources. There are a number of problems for private sectors as they make strides to mine from asteroids. The most obvious problem is whether a mining entity can legally claim ownership of resources mined from asteroids.⁵

Whereas, space law is constantly playing catch-up with technology, many areas of space law are ambiguous in particular, the status of property and liability in space activities. This ambiguity decelerates private investment in space

⁵ K. MacWhorter, Sustainable Mining: Incentivizing Asteroid Mining in the Name of Environmentalism, *Oregon Review of International Law* [Vol. 17, 183, 2015, p. 185.

exploration, technology, and mineral exploitation. It refers to a wide set of legal doctrine. It ranges from commercial contract terms that determine the specifics of individual space launches to more general issues of states behaviour in space. It is particulate law, developed to deal with the practical problems of the use and exploration of outer space such as the rapid pace of technology in space travel. It never seeks to regulate technology, but rather aims to place order in the competing human interests that result from that technology.” As technology develops, governments have had to create new regulations and procedures. The space law will never keep up with the development of technology. Much like the property issue faced today raised questions about the ambiguity associated with space exploration.⁶

The extent of application of space law plays a key role in determining the legality of space mining. Space law legislation was a defensive move to preserve and protect the realm of outer space from conflicts. Consequently, the Outer Space Treaties subject to certain elements of control and restraint contains principles that are permissive. Space mining is also subject to such controls and restraints. However, space mining is not yet compatible with the existing legal regime. The incompatibility begins with the jurisdiction of space law and classification of natural resources in space, particularly celestial bodies. International Space Law has been accommodating the various activities that have advanced in space. This will persist for space mining too. Nonetheless, distinctiveness of this activity demands more from the existing regime in terms of precision and in certain cases, expansion or supplementation. Clarifying the legal status of property in space is necessary for any future exploration and exploitation of natural resources in space. The technology behind asteroid mining is fast becoming a reality and the law must respond. In order to evaluate what the international community needs to accomplish to ensure future exploration, one must explore the international agreements already in place that speak to the issue of property rights.⁷

There are five international agreements that lay a framework of space law and, more importantly, ownership of objects and celestial bodies in space. Further, international law in general was conceived to deal with relations between States, not to deal with private claims of property. International conventions offer some guidelines, though they do not formally establish a property regime.

The Outer Space Treaty dedicates that the common use of space for all nations, however, growing population and shrinking supply of crucial resources requires rethinking the Treaty application. The real property ownership in space is illegal. It, however, only bars claims of celestial bodies, but not

6 J. M. Gaba, *John Locke and the Meaning of the Takings Clause*, 72 MO. L. REV. 525, 536, 2007, p. 529.

7 https://swfound.org/media/205528/dunstan_secure-world-asteroids_-5-5-16.pdf (last Visited Sep. 2, 2017).

extracted materials. The term celestial bodies have never been fully defined in space law, but it applies to planets, moons, and asteroids. It seems clear then that private fee simple ownership is out of the question given the promise in Article II that outer space shall be free for exploration and use by all States.” What it does not rule out is the availability of limited property ownership in extracted minerals. The Outer Space Treaty clearly prohibits appropriation of whole celestial bodies but is far less clear concerning rights over extracted resources. The Treaty seems to foresee some sort of resource extraction and use though the enactment of the Moon Treaty and its prohibitions on owning resources cast doubt upon whether private ownership and commercialized use of these resources is acceptable to the international community.⁸

The Moon Treaty took a severe stance regarding property ownership in space. It has been called the arch-enemy of space development” and considered a failure. The document is important, however, because it is the only international space treaty that actually contemplates property ownership in space, though it ultimately denies any possibility of ownership. The treaty Moon reiterates the Outer Space Treaty designation of space as for the exploration and use of all nations. It places above private property rights the right to explore and use the Moon for scientific benefit. Finally, it establishes the Moon as the common heritage of all mankind.” Any natural resource exploitation would have to be governed by the international community for the benefit of the international community. This provision turned many space-faring countries off of the treaty, and its economic disincentives would have slowed any private interest in space mining. Therefore, the treaties and customary law does not establish a systematic property rights framework.

Ownership of real property in space is forbidden by the Outer Space Treaty. Ownership of personal property, however, is allowed under certain conditions, as revealed by registration and liability requirements.⁹ Finally it seems that the international treaties are binding on both States and their nationals, and consequently space mining cannot be undertaken by companies for private gain in a way that would exclude the rest of mankind.

With respect to space mining and that is new regulation is required to promote and open up this activity. It would be advisable, when preparing any new regulations, to take into the account two similar cases, the Antarctic and seabed mining, since they have been the subject of intense legal debate as both are considered to belong to mankind, and not subject to the jurisdiction of a specific country.

8 C.Q. Christol, *Article II of the Outer Space Treaty Revisited*, 9 *Annals of Air and Space Law* 217, 1984.

9 www.stardust-consulting.es/publications/article8.pdf(last Visited Sep. 2, 2017).

Because international space laws are vague, some states decided to approve a special national act on space mining by their national such as U.S.A¹⁰ and Luxembourg.¹¹The U.S. Congress has provided a framework for understanding property rights concerning resources mined from celestial bodies. This activity culminated in November 2015 when President Obama signed into law the Space Resource Exploration and Utilization Act (“Space Act”). The Space Act then outlines the property rights for U.S. citizens over asteroid and space resources. Luxembourg’s parliament has passed a law that makes it the first European Union country to offer legal certainty that asteroid mining companies get to keep what they find in space. Similar to provisions in the Commercial Space Launch Competitiveness Act, which became law in the U.S. in November 2015? The Act was similar in scope to the U.S. law, with the exception that companies need not be based in Luxembourg to take advantage of its provisions.

Advocators of the Space Act explain that it is broad and designed to “promote the development of a United States commercial space resource exploration and utilization industry and to increase the exploration and utilization of resources in outer space.” They say the Space Act is not aimed at circumventing the national appropriation prohibitions from the Outer Space Treaty, but rather seeks to provide certainty as to the rights of private entities to “remove, take possession of, and use in-situ asteroid resources.” Proponents also add that the Space Act seeks to put some meat on the bare bones of space property rights. However, the opponents say that the Space Act will lead to inevitable breaches of the Outer Space Treaty. The Outer Space Treaty seeks to promote the “free access to all areas of celestial bodies.” although an entity is given too much freedom in its operations to extract resources, free access might be hindered.¹²

It seems that the Space Act is lack of a system of licensing. This is troubling to some because the Outer Space Treaty requires countries to take control over their citizens operating in space, and the lack of a licensing scheme might mean that the U.S. is refusing to meet these international obligations. The Space Act might also violate Article II of the Outer Space Treaty’s prohibition on national appropriation of celestial bodies. In international law, there are no property rights unless they are granted by a superior power. With the Space Act, the U.S. gives itself the authority to confer property rights over space resources even before they are extracted. Thus, it seems to follow logically that the U.S.

10 H.R.2262 – U.S. Commercial Space Launch Competitiveness Act. (last Visited Sep. 2, 2017).

11 www.spaceresources.public.lu/content/dam/spaceresources/news/Translation%20Of%20The%20Draft%20Law.pdf.

12 *Mars One Mission*, MARS ONE, www.mars-one.com/mission (last Visited Mar. 20, 2015).

is appropriating at least some part of a celestial body in order to do this – against the express prohibitions of the Outer Space Treaty.

Some international space research institutes have investigated the national laws of countries for space mining and conflict with international space law. The International Institute of Space Law (IISL) issued a paper in which it concludes that the United States' Space Act does not appear to violate the Outer Space Treaty. The paper does not outright endorse the Space Act, but it points out that the Space Act does not give rights over celestial bodies themselves nor does it supersede the United States' international obligations, which, presumably, include the Outer Space Treaty.

The Hague Space Resources Governance Working Group also was created to promote international cooperation and multi-stakeholder dialogue. It has designed the building blocks below to lay the groundwork for international discussions on the potential development of an international framework, without prejudice to its form and structure.¹³ The Working Group aimed to assess the need for a regulatory framework for space resource activities and prepare the basis for such regulatory framework and recommend on implementation strategy and forum for negotiations on an international agreement or non- legally binding instrument. It will continue to explore the need, and form, of any future mechanism(s) for the governance of space resource activities and hopes that its activities will complement efforts at the national, regional and global level.¹⁴

Therefore, the main question is open whether this legal situation is satisfactory” and that it remains to be seen to what extent such an interpretation will be acceptable to other countries. Because of this international uncertainty, serious questions remain to be answered concerning whether or not the recently passed Space Act will both comport with international law and lead to efficient and safe space-mining operations.¹⁵

At the international level, beyond the broad provisions of the Outer Space and Moon Treaties, there is nothing to regulate space resource mining, but discussion within the U.N. at various workshops and gatherings about both the need to strengthen international space law adherence in general and to create a framework that guides and governs commercial space activities. A number of recommendations have been proffered in these workshops.

Current international space agreements are vague, lacking in consensus, and provide little precedent for ownership of space resources. This has led the international community to move in the direction of creating a better regulatory framework, but this movement is still in discussion stages and is likely to take a while to come to fruition.

13 <http://law.leiden.edu/organisation/publiclaw/iiasl/working-group/the-hague-space-resources-governance-working-group.html>.

14 <http://media.leidenuniv.nl/legacy/draft-building-blocks.pdf> (last Visited Sep. 2, 2017).

15 www.iislweb.org/docs/SpaceResourceMining.pdf (last Visited Sep. 2, 2017).

Therefore, it seems that International community needs to create a new international framework be developed in order to determine the related rules, which should include the protection of property rights such as liability. Specifically, it will be vital for countries to enter into an international agreement. This agreement would regulate how individual states and their citizens interact with resources mined from space. Such an agreement should recognize not only the property rights of the extracting commercial entities but also the rights of non-space-faring countries to benefit from the minerals as well. This might include the creation of an international body that will ensure that the interests of all nations are maintained by distributing funds and technology to less wealthy or non-space-faring nations. According to the agreement, we need to create an international regulatory body and scheme. In the same way, space-faring countries could form an international body that helps create and maintain a uniform space-mining legal framework.¹⁶

3. Liability

The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Space Objects Launched into Outer Space, the Liability Convention of 1972, and the Registration Convention of 1975 expand the scope of the Treaty on Principles Governing the Activities of Space, Including the Moon and Other Celestial Bodies (the OSTs). These treaties get at how responsibility should be established, what a state may own in space, and liability in the case of damage. They provide the responsibilities, the boundaries and the main constraints on state activity.” These treaties also reveal a new method of developing international law, bringing together the different and sometimes divergent legal traditions of the world to cope with new problems in a way that the formulation of earlier international law did not.”

These treaties are important to consider for a comprehensive private property scheme in space, because they outline liability and potential ownership issues. They do not, however, extend to private actors. Any property scheme in space would have to take this into account Under Article VI of the OSTs, a state party bears responsibility for all activities of its nationals in outer space. The Liability Convention expands liability provisions of the OSTs. The Outer Space Treaty Article I paragraph 2 and Article III indicate that ordinary rules of international law in relation to liability should be applied. This treaty not only contemplates liability by state actors, but also international, intergovernmental entities. The Preamble defines the scope of the treaty: to strengthen international cooperation in the field of the exploration and use of outer space for peaceful purposes.” The accepted international liability by the State Party under Article VII of the Outer Space Treaty (and the provisions of the

16 G. M. Danilenko, *Outer Space and the Multilateral Treaty-Making Process*, 4 Berkeley Tech. L.J. 217 (1989), pp. 217-248.

subsequent Liability Convention) need not be passed directly to private entity. Instead, it is a matter for the State to decide whether and to what extent it will impose liability. At that time, there were no international joint efforts, even less the participation of the private sector, in space activities. Four decades later; however, most activities are conducted by commercial concerns operating on a multinational level. The Liability Convention is proving to be inadequate in addressing the issue of the third party liability, private space activities.

Applicable criteria under Article VII of the Liability Convention are that the State which launches or procures the launching of an object into outer space is liable. One of these challenges is the question as to whether international liability applies at all in the case where a private entity launches an object into outer space. Unlike the Article VI, no mention is made in Article VII as to non-governmental entities, therefore, placing in question whether the activity of a private entity, which in fact launched or contracted for the launch could result in liability of its State. The consequence of a negative answer to this question might be that States do not provide in their domestic legislation for any recourse against the private entity in such a situation.¹⁷

The launching State is absolutely liable and is liable in different degrees of fault, but in final consequence the State is liable for damage caused by a private enterprise. It is imaginable that States refuse to allow private enterprises to perform space activities, or that States set up exaggerated requirements just because of the above mentioned state-liability. This could lead to some kind of forum-shopping towards launching States that either cannot or do not want to grant sufficient control over space activities, or that – in case of damage – would not pay compensation anyway, because of the lack of legal tools for enforcement. Therefore, unlimited liability of States practically according to the Liability Convention is cut by international agreements that stipulate a limited but guaranteed maximum-amount-liability for space activities.¹⁸

The issue of procuring a launch has raised a problem in the context of private launch activities. The mere link of nationality of a private launch operator is not sufficient to make that State a launching State. The launching state must actively request, initiate or promote the launching of the space object to have procured the launch. An active role on the part of the State of nationality may be considered unnecessary for a State to be considered to have procured a launch.¹⁹

17 C.Q. Christol, *The Modern International Law of Outer Space*, Pergamum Press, 1982, pp. 39-42.

18 R. Gimblett, *Space Insurance into the Next Millennium*, in: *Outlook on space law over the next 30 years*, Kluwer, 1997, p. 163.

19 Wayne White, *The Legal Regime for Private Activities in Outer Space*. See in www.spacefuture.com/.

Therefore, it is better for international community to provide a new treaty on private international space law by modelling the Intergovernmental Agreements (IGA) and private international air law which could overcome. The will to establish a common legal regime on specific questions, seems to be the direction suggested by the doctrine and practice of partner States for future developments of the legal framework of new liability regime. The IGA establishes that each State maintains jurisdiction and control over its personnel, it has been necessary to involve the States in the decision and internal application of the code rules.²⁰

The Intergovernmental Agreement is a structure of rules that can be considered as a framing law to regulate documents on the matter specifically established for the space activities. The risk allocation regime established under the International Space Station Agreement constitutes an exception to the regime in the Liability Convention; however, it can be used in new treaty. The Liability Convention allows the possibility of arrangements between launching States to distribute the risks arising from a joint launch. The risk allocation regime, however, may not impair the right of a non participant State sustaining damage to seek the entire compensation due from any or all of the launching States.

Furthermore, the Article 23 of the Liability Convention supports this conclusion, as it further prescribes that the Liability Convention has no effect on other treaties so far as relations between parties are concerned and that States can enter into treaties reaffirming, supplementing or extending its provisions, provided, however, that this regime do not affect the rights of the victims.²¹ The approach of international space law needs to be deeply reconsidered and re-defined to enable private enterprises to (directly) perform outer space activities. The desirable solution could be a differentiating stage-to-stage system, that makes e.g. air law applicable in air space and space law for outer space, or a strictly purpose oriented system, or a completely new international instrument that combines all these elements especially designed for the needs of commercial space activities in legal code.

There arise in the future concrete factual situations that make desirable or even necessitate consideration of one or more specific amendments to the space treaties. However, consideration of such amendment(s) should not take place in the abstract. It is up to these States to decide how to abide by their international obligation of authorization and continuing supervision. In cases where their non-governmental nationals conduct such activities and whether in the event of damage caused by the latter, the State wishes to apportion all or a part of such liability to such actors.

20 R. Jakhu, *Towards Long-term Sustainability of Space Activities: Overcoming the Challenges of Space Debris*, (2011); www.oosa.unvienna.org/pdf/pres/stsc2011/tech-35.pdf (last Visited Sep. 2, 2017).

21 J. Hermida, *International Space Law*, Kluwer Academic Publishers, 2004. p. 27.

Since 1972, the Liability Convention has provided guidance on the legal principles to be applied in the case of damage caused by space activities. However, its provisions remained untested and some of the uncertainties that exist in the Liability Convention continue to fuel academic debates on many occasions. This is further complicated by the increasing privatization and globalization of the space industry at a pace not foreseen by the authors of the Liability Convention, promoting several States to recognize the need to adopt a new legislation in order to be able to pass on the unlimited international liability under the Liability Convention to private operators.

There are elements of air law that make it attractive to use air law as a source of legal configurations that might fit to space debris. While this is unlikely to occur in the near future, it will eventually become necessary for States to reform the liability regime for space activities, similar to the liability frameworks in place in private international air law, in order to reflect the nature of the space industry and to reduce the emphasis being placed on States to be liable for the activities of private operators.

International community need to provide a new regime for liability in private international space law in private international air law. Although international liability of states for damages is acceptable regarding the type of activities, due to high costs of compensation, private sector cannot afford it. However, nowadays space activities are moving toward more engagement of private sector no longer the states are the sole actors. Therefore in order to enhance the activities of private sector, a unified international liability regulations regime should be established. It is obvious that the unified regulations should not be in conflict with the public international instruments.

4. Conclusion

International law does not encourage private commercial space section to exploit outer space. Although five space treaties do not develop a comprehensive scheme of property ownership, they do reveal that ownership of private property is allowed under international law and does not prohibit exploitation. International law requires an international regime to be established to govern the process of exploitation, particularly to oversee the “equitable sharing” of the benefits. A new international regime can and should be established. A space district could potentially resolve many of the important problems confronting the establishment of such a regime

The Outer Space Treaty already provides a framework in which a scheme of limited private property ownership in extracted asteroid minerals. This framework may be developed to include private asteroid mining; however, the OST must be amended to resolve all legal ambiguity. It is certainly reasonable to expect the international community to resolve the ambiguities surrounding the Outer Space Treaty position on personal property in space. Simplicity and a tried-and-true avenue for international space legislation is the best way to

approach this issue. The Liability Convention 1972 provides provisions that includes liability regime for states and private sector, there are ambiguities about liability of individuals. There are questions as to whether it protects private sectors against public sector as well as a private sector. According to space law launching States are liable in case of an accident of activities of private section into outer space. The launching State bears the risk that a possible recourse against the private section may not be satisfactory because the section is not insured.

The private sector needs that the international community supports their interests against others. Liability of private sector is naturally different from responsibility of states and public sector in space international law. Therefore, survey the challenges of the legal regime of exploitation on Space Resources and O-Earth Mining with particular reference to liability for private sector is necessary in order to settle main obstacles for space activities of private section to mine and use the resources of the Moon and other celestial bodies. The approach of international space law needs to be deeply reconsidered and re-defined to enable private enterprises to (directly) perform outer space activities. Otherwise, space activities will have to be performed by private sections under the regime of States, which provokes conflicts that can be avoided. There arise in the future concrete factual situations that make desirable or even necessitate consideration of one or more specific amendments to the space treaties.

Finally, mining the Moon or other celestial bodies will require much contemplation; however, regulating asteroid mining can be achieved relatively simply. Investors are willing to provide capital for ventures to one day mine an asteroid. To make that a reality, the law must reflect those ambitions. By guaranteeing rights in extracted minerals taken from space, private industry could usher all of humanity into a new technological era.

