

Current Issues Being Discussed in Space Law

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ABSTRACT

Since the beginning of the space era, space activities have been varied, and private actors have started to become involved. This development over the years has raised new legal questions, which could have not possibly been foreseen during the enactment of the United Nations space treaties. Therefore we see a lack of regulations or non-binding soft law instruments related to developing space activities.

In this work, I introduce some of the legal issues being discussed in the space law community and ask what the problems are, how the UN space law treaties would address these problems and what should be done to overcome the legal problems. It is not possible to treat all of the legal discussion here, therefore I pick some of the hot topics such as space debris, space tourism, space mining, and Mars colonization.

Keywords: The UN space treaties, Space debris, Commercial space flight, Utilization and use of space resources, Mars colonization

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1. Introduction

The necessity for a legal regime in space appeared with the invention of rocket technology. Along with the development of satellite technology, the main principles and rules of space and space activities have been in place since the 1960s.

So far there are five international treaties (the Outer Space Treaty, the Rescue Agreement, the Liability Convention, the Registration Convention, the Moon Agreement), the United Nations General Assembly declarations, and guidelines adopted by the United Nations Committee on the Peaceful Use of Outer Space (UNCOPUOS). As these treaties were enacted in the Cold War era by a small number of states and the regulation of today's space activities was not anticipated, declarations and guidelines have been adopted to address some issues that have arisen later (Freeland, 2010). However, declarations and guidelines are not binding on states and still do not answer the legal questions related to developing space activities.

To sum up, space law does not deal with some of the recent and upcoming space activities, and this situation brings forth current legal discussions being made by the space law community. In this study, space debris, space tourism, space mining, and the colonization of Mars are examined as examples of the current legal discussions in space law.

2. Space Debris

2.1. Introduction

Space debris is becoming a threat to current and future space activities since low earth orbit and geostationary earth orbit are limited natural resources. At this rate, the growing number of satellite launches and the increasing number of space debris will exceed the capacity of the earth's orbits. Thus, Prof. Kessler proposed a theory that suggests the density of space objects in low earth orbit would be high enough to trigger an uncontrollable chain of collisions (Kessler & Cour-Palais, 1978). So far, 28,600 debris objects are being tracked by Space Surveillance Networks, and it is estimated that the number of debris objects greater than 10 cm is 34,000, the number of space debris objects between 1 cm - 10 cm are 900,000, and the number of space debris objects greater than 1 mm - 1 cm is 128 million (European Space Agency, 2021).

Legal regulations on space debris especially became a hot topic in 2009 when an American communication satellite, Iridium 33, and a Russian military satellite Cosmos 2251, collided at an altitude of eight hundred kilometers above sea level and generated more than two thousand fragments (Tan, Zhang & Dokhanian, 2013). This incident and the amount of space debris in Earth's orbit mentioned above show us the seriousness of the issue and the need for a legal regime for space debris, since main space law treaties do not address the issue. In this regard, the discussion for the legal regime mainly focuses on the definition of space debris, mitigation of space debris, and the liability for damages caused by space debris.

2.2. Legal Discussion Related to Space Debris

2.2.1. Legal Definition and Status of Space Debris

Under this discussion, the question is whether space debris is considered a space object. If space debris has the status of space objects, the provisions on space objects would apply to space debris for certain topics (like liability).

In the Liability Convention (LC) and the Registration Convention (RC), space object is used as a term which consists of the object itself and its parts, as well as its launch vehicle and parts thereof. Even though there is no clear definition in the treaties, the definition of a space object as an object that is launched or attempted to be launched into outer space can be deduced from the wording of the treaties (Hobe, 2019).

As for space debris, there is neither reference in the United Nations space treaties nor a universally accepted legal definition of it. However, we can find a general understanding which defines space debris. According to the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, space debris consists of “all man-made objects, including their fragments and parts, whether their owners can be identified or not, in Earth’s orbit or re-entering the dense layers of the atmosphere that are non-functional with no reasonable expectation of their being able to assume or resume their intended functions or any other functions for which they are or can be authorized” (Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, 1999). Besides the Space Debris Mitigation Guidelines of the Inter-Agency Space Debris Coordination Committee (IADC), the Space Debris Mitigation Guidelines of the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) and European Code of Conduct for Space Debris Mitigation may also have a similar definition (Morozova & Laurenava, 2021).

From the definitions mentioned above, the most important element for a space object is to be launched or attempted to be launched into outer space, and for space, debris is related to the functionality of the launched space object. The conclusion we can draw from both definitions is that the operativity of the object is not the element of the definition of a space object. To put it in other words, no matter if the object still functions or not, a launched object and its parts are considered to be the space object. Therefore, space debris would be legally considered as a space object, since the debris is part of the object (Morozova & Laurenava, 2021).

2.2.2. Mitigation of Space Debris

In the face of the threat to the security and sustainability of space activities, the solution to the increasing number of space debris is to prevent and mitigate the occurrence of new space debris in orbit. Therefore actors are recommended to take the ultimate precaution against possible collision: to remove space objects from their orbit at the end of their operation, and so on.

The United Nations space treaties do not provide a legal foundation for the mitigation of space debris. Instead, there are soft law documents enacted by the IADC, the UNCOPUOS, and Europe’s Network of Centres on Space Debris. Among the documents conducted by

the mentioned actors, the IADC guidelines are the pioneering instrument for the mitigation of space debris. It focuses on the limitation of the debris realized during normal operations, minimization of the potential for on-orbit break-ups, post-mission disposal, and prevention of on-orbit collisions (Inter-Agency Space Debris Coordination Committee, 2007).

The Space Debris Mitigation Guidelines adopted by the UNCOPUOS suggests limiting debris released during normal operations, minimizing the potential for break-ups during operational phases, limiting the probability of accidental collision in orbit, avoiding intentional destruction and other harmful activities, minimizing the potential for post-mission break-ups resulting from stored energy, limiting the long-term presence of spacecraft, launching vehicle orbital stages in the low-Earth orbit region after the end of their mission, limiting the long-term interference of spacecraft, and launching vehicle orbital stages with the geosynchronous Earth orbit region after the end of their mission (United Nations Office for Outer Space Affairs, 2010).

In addition to these two soft law instruments, the space agencies of some European countries also adopted a “code of conduct” on space debris mitigation inconsistent with the European debris policy. The instrument mainly aims to prevent in-orbit break-ups and collisions, to remove and dispose of the spacecraft at the end of its operation from the useful densely populated orbits, and to limit the release of objects during normal operations. To achieve these goals, the document suggests measures on management, design, and operation. For design and operational measures, the document further provides prevention, end-of-life, impact protection, and re-entry-safety measures (Europe’s Network of Centers on Space Debris, 2004).

To sum up, the measures to prevent and mitigate the occurrence of space debris are defined by these instruments and have created a legal regime at the international level. The problem regarding these instruments is the implementation of their provisions since they are not binding on states. However, it is not wrong to say that these instruments have an impact on states when they adopt space debris measures in their domestic legal system. Thus, we can see some references to soft law measures in some of the domestic legislations of space-faring states (United Nations Office for Outer space Affairs, 2021).

2.2.3. Liability for the Damages Caused by Space Debris

The Outer Space Treaty (OST) and the Liability Convention (LC) give international liability to the launching states for the damages caused by space objects and provide two types of liability which depend on the area damaged occurred: Absolute liability and fault-based liability. Absolute liability is the liability for damages that occurred on the surface of the Earth and to aircraft in flight regardless of the fault of the launching state, whereas the liability for the damages to space objects in outer space is based on the fault of the launching state.

Over time, space activities have been commercialized, and private actors have joined the space league. Even though commercial space activities dominate the entire sector today, launching states remain the liability for damage caused by a privately owned space object, because of the state-centric liability regime of space law. Therefore, states pass their liability to the private actor through licensing and imposing obligations like mandatory liability insurance (Hertzfeld & Sáinz, 2017; Morozova & Laurenava, 2021).

As for the damages caused by space debris, liability regime is applicable, since the definition of a space object does not change in the LC (Morozova & Laurenava, 2021). Therefore, the launching state will be liable for the damage caused by space debris generated from a state- or privately-owned space object, as long as the launching state of the debris is identified. After the commercialization of space activities, states oblige private actors to insure their activities to pass their liability, and the damage from space debris is covered by the ‘all-risk’ satellite property insurance (Swiss Re, 2011).

3. Space Tourism

3.1. Introduction

Space tourism is “*any commercial activities offering customers direct or indirect experience with space travel*” and the person who participates in space travel is called a space tourist (Hobe & Cloppenburg, 2004). It started as a new commercial space activity in 2001, with the visit of Denis Tito to the International Space Station (ISS). Following Tito, there have been eight other visitors to the ISS so far (Street, 2021).

Today the space tourism industry offers more than just visiting the ISS. The industry focuses on orbital and suborbital flights, even intercontinental rocket transport, including more than one person with a reasonable price (Freeland, 2011). Thus, Virgin Galactic has been developing since 2016 and performed its first fully crewed space flight (two pilots and four passengers, including Richard Branson founder of Virgin Galactic) on 11 July 2021 as their 22nd test. The company announced that it will start commercial flights in 2022 after completing two more tests (Virgin Galactic, 2021).

Along with Virgin Galactic, Space X and Blue Origin are also in the space tourism sector. Blue Origin launched its self-autonomous capsule called New Shepard with four passengers, including Jeff Bezos, founder of Blue Origin, to an altitude of more than 100 km on 20 July 2021 (Sheetz, 2021), and Space X took four tourists (Jared Isaacman and three people sponsored by him) to circle Earth at low-Earth orbit via its Crew Dragon capsule on 15 September 2021 (Chang, 2021).

In addition to commercial suborbital and orbital flights, the first space construction company called Orbital Assembly Corporation is planning to launch the world’s first commercial space hotel in low-Earth orbit. The hotel called Voyager Station is designed to host up to 400 guests and is planned to start a business in 2027 (Spry, 2021).

As seen above, space tourism has had and will have different forms. In this study, I will only focus on the commercial space flight aspect of space tourism, since it is a very hot topic nowadays.

3.2. Legal Issues Related to Space Tourism

3.2.1. Legal Status of Space Tourists

The companies which offer commercial space flight declare their passengers as astronauts in their advertisements to promote their activities. Calling these passengers astronauts

immediately brings the very obvious question to our minds: Is it appropriate to define space tourists as astronauts, since space tourists participate in commercial space flight for pleasure and recreation?

The definition of space tourists as astronauts or personnel of a spacecraft is important for checking whether the provisions of the OST and the Rescue Agreement (RA) are applicable to space tourists. According to Article V of the OST and the RA, astronauts are defined as ‘envoys of humankind’, and states shall render to the personnel of a spacecraft all possible assistance in the event of an accident, distress, or emergency landing.

“The envoys of humankind” term is not explained nor defined in the UN space treaties. However, since the beginning of the space era, astronauts have been sent on missions which contribute to the public interest. From the practice, we might say that being an envoy of humankind should be more than visiting space. Therefore, it seems to be improbable to consider space tourists as astronauts (Yun, 2009).

The term “personnel” is generic and for space objects is said to include astronauts, engineers and scientists, and so on. Some scholars argue that space tourists could qualify as personnel for space objects with a broader interpretation of the term and be subject to the RA (Hobe, 2007). However, the ordinary meaning of “personnel” refers to the persons who have responsibilities and duties related to the operation of the spacecraft (Cheney, 2019). Therefore, space tourists cannot be defined as the personnel of the spacecraft, either.

Even though there is no legal definition for space tourists at the international level, there are two examples we should mention here. After Tito’s visit, participating space agencies of the ISS agreed on the people who could be allowed to visit the station. According to the agreement, the people allowed on the ISS are divided into two groups: professional astronauts and spaceflight participants. In this classification, space tourists are considered to be space participants and have different obligations (Freeland, 2005). We can also find a similar approach in US law. According to the Commercial Space Launch Amendments Act of 2004, space tourists are defined as space flight participants. In the act, “any employee of a licensee or transferee, or of a contractor or subcontractor of a licensee or transferee, who performs activities in the course of that employment directly relating to the launch, reentry, or other operation of or in a launch vehicle or reentry vehicle carries human beings,” are defined as crew, and “an individual who is not crew” is defined as a space flight participant (Commercial Space Launch Amendments Act, 2004). Recently, the Federal Aviation Administration (FAA) issued an order to award Commercial Space Astronaut Wings to the eligible crew members of the commercial space flight. Under USA jurisdiction, this order opens the opportunity for commercial space flight crew members to have the status of astronauts defined by the UN space treaties. Since this program is established for the crew members, there is still no room for space flight participants to be called astronauts (Federal Aviation Administration Commercial Space Astronaut Wings Program, 2021).

It seems that this issue will not be able to be solved by the interpretation of the definitions of astronauts and personnel for space objects. Instead, there should be a specific reference to the legal status of space tourists in an international legal instrument, like in the case of the ISS and the US Commercial Space Launch Amendments Act.

3.2.2. Applicable Law for Space Tourism

The discussion here is to define which legal regime could be applied for the activity since space travel, especially suborbital flights, is performed both in air space and in outer space. Air space is ruled by air law, which has different legal regimes on national and international air space. However, outer space is one whole area, and is ruled by one unique regime. Both air law and space law have different provisions in terms of sovereignty, freedom of navigation, international responsibility, and liability, and so on (Hobe, 2007; von der Dunk, 2015).

The issue of applicable rule for space tourism brings forth the question of delimitation of air space and outer space once again, since the location of the activity is important to designate the applicable regime to the activity (Yun, 2009). The ongoing discussion on the delimitation of air space and outer space has two approaches, one is the spatial approach and the other is the functionalist approach. The spatial approach suggests designating a physical boundary between air space and outer space based on the scientific facts (von Karman line, effective control, aerodynamic lift, etc.). The functionalist approach does not suggest a line between air space and outer space, instead, it proposes to apply space law according to the purpose of the mission, design of the object, and the mission's impact on space traffic (Freeland, 2011).

For the moment, there is no agreed horizontal border between air and outer space. Therefore, we have to use a functionalist approach to find the applicable rule to commercial space flights. With the functionalist approach, it can be suggested that space law is the applicable rule for space tourism since the purpose of the activity is to offer an experience for the participant of the space travel (Wollersheim, 1999).

3.2.3 International Liability for Space Tourism

As discussed above, space law gives the liability to launching states for the damages caused by space objects, no matter if the object is operated by a State or a private person. The damage defined by the LC article I includes "loss of life, personal injury or other impairment of health, loss of or damage to property of States or of persons, natural or juridical or property of international organizations." The Convention provides absolute liability for the damages that occurred on the surface of the earth or to aircraft in flight, and fault-based liability for the damages that occurred elsewhere than on the surface of the earth or to persons or property on board.

The events are defined on the assumption that the damages are caused by one space object to individuals, to States, to an aircraft and people on board, to another space object and its personnel in it (third party liability). However, it does not include the liability of the launching state for the damages incurred to space flight participants during the flight (Hobe, 2007). Therefore, a specific liability regime for commercial space flights should be created at the international level. Each state might enact their legislation on the liability for the damages that occurred to space flight participants, like the USA; however, this could create a hydra-headed liability regime for a developing business. The lack of a uniform legal regime would bring more uncertainty to the area (Freeland, 2011).

Another point discussed on the applicability of the liability regime of the UN space treaties to space tourism activities is the state-centric structure of the liability regime. According to the

regime, launching states are the liable actors in the case of damage caused by a space object no matter if it is operated by private actors or by a state. Therefore, launching states obligate private actors to have insurance, or the amount of liability is transmitted to the private operators through legislation, like in the case of Australia (Freeland, 2011) and the USA (Los Banos, 2017).

Consequently, it seems that the LC is not a response to the need for a liability regime for space travel. Obviously, we need a liability regime specific to commercial space flights, which defines the damages to space tourists and addresses the compensation of the defined damages.

3.2.4. Registration of Space Objects Used for Commercial Space Flights

In the classical registration regime, each space satellite is registered to the national and international registry before its launch into space, and the international registration includes the name of launching state, an appropriate designator of the space object and registration number, date and territory or location of launch, basic orbital parameters (nodal period, inclination, apogee, perigee), and general function of the space object (Registration Convention, Art. IV). As seen above, space law only provides a registration system for satellites and constellations that are placed into Earth orbit. However, there is no specific registration system for the vehicles of commercial space flights.

In practice, commercial space flight activities are subject to licensing and the licenses are published and updated by the relevant authority. For instance, in the US system, commercial space transportation activities are subject to the authorization of the FAA, and must obtain a reusable launch vehicle mission license (14 CFR III, Part 413.1). So far, the companies which are the pioneers of commercial space travel (Space X, Blue Origin, and Virgin Galactic) are licensed by the FAA (Commercial Space Transportation Licences). Furthermore, VSS Unity of Virgin Galactic and its carrier vehicle WhiteKnightTwo are registered as glider and fixed mix multi-engine under the FAA aircraft registry, respectively (Federal Aviation Administration, n.d.).

Consequently, a reusable launch vehicle and its air carrier/rocket, which is designed to perform a suborbital flight, are legally registered as aircraft, even though they are designed for a commercial space flight. This means that neither the current space object registration system nor this current US practice suits the registration of space transportation/flight objects. Therefore, it seems that there is a need for international standards for the national registration system specific to the space objects, which are used for commercial space transportation, like in the case of the national registration of aircraft (Yun, 2009).

4. Space Mining

4.1. Introduction

Exploration and utilization of natural space resources are not new. Earth orbits, as limited natural resources have been used since the beginning of the space era, and different missions of different countries have been collecting and analyzing samples from asteroids, the moon, and

Mars. However, the development of space technology and commercialization of space activities has driven human beings to do more like settling on the moon and Mars, exploring deep space, and even exploiting space resources to make a profit. These drives of our generation let space-faring states and the space sector capitalize on space mining. However, space mining is not an easy task and contains financial and technical hurdles.

Why space mining? The first reason for space mining is to create a sustainable habitat for humans on the moon and Mars for future human settlement since bringing necessary resources from Earth is expensive and time-consuming. For instance, with 3D printing technology and the elements found on the moon, tools, and facilities can be produced and installed there. Secondly, water on the moon could be used to produce rocket propellant to be used for interplanetary exploration. Lastly, elements that are rare on Earth (like Helium-3) could be brought to Earth to be used as an energy resource (Mallick & Rajagopalan, 2019).

It seems that there is both public and private interest in space mining. As space mining emerges, some legal questions rise alongside this new commercial activity. In this work, I introduce the discussion on the legality of space mining and the regulation of space mining at the international and national levels.

4.2. Legal Issues Related to Space Mining

4.2.1. Legality of Space Mining

After the US recognized space mining as a space activity and authorized US citizens to possess, own, transport, use and sell space resources in 2015, the legality of space mining according to the UN space treaties started to be questioned. The OST is silent, does not have an explicit provision, whereas the Moon Agreement (MA) has a clear answer since the provisions of the agreement permit the exploitation of the moon's resources. However, the agreement is not favored by most of the space-faring countries, and is not useful to answer the question of the legality of the utilization of space resources. In this case, we turn back to the OST to answer the question at hand.

With regard to the principles laid down by the OST, there are two interpretations on the legality of the utilization of space resources. One interpretation argues that space mining is forbidden by the treaty, because of the prohibition of state sovereignty in outer space (Gorove, 1977). The other interpretation supports the opposite, and claims, "everything which is not forbidden is allowed" (the Lotus principle in international law). To put it another way, the OST permits the exploration, utilization, and use of outer space, since it does not prohibit the utilization of space resources (International Institute of Space Law, 2015). The articles, which support this interpretation, are:

1. Article 1/I: the exploration and use of outer space shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind;
2. Article 1/II: outer space shall be free for exploration and use by all States;
3. Article 2: outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.

4.2.2. How to regulate space mining activities: International and national efforts

- Proposals from the non-governmental initiatives for an international regime: Today the majority of academia and space actors accept that the utilization and use of space resources are permitted by the OST. However, that majority also agrees that space mining and utilization of space resources should be regulated under an international legal instrument (Tronchetti, 2009; Lee, 2012).

As the outcome of the idea for an international regime, we see three different legal frameworks on space mining and the utilization of space resources proposed by three different non-governmental initiatives. I call them initiatives because only one of them has non-governmental organization status; the other two are created as a working group for this specific matter.

The first civil initiative, which focuses on the international framework for the governance of space resources activities, is the International Space Resources Governance Group established in January 2016. It consists of 32 members including representatives of industry, space agencies, international organizations, governments, academia, and civil society, and more than 90 observers from various countries. Their work, after four years, has brought results and they have shared their framework titled 'Building Blocks for the Development of an International Framework on Space Resource Activities' (the Building Blocks) with international society in November 2019 (Bittencourt & Hoffman & Mason-Zwaan & Stefoudi, 2020).

Another initiative that should be mentioned here is the Moon Village Association. In 2017, this association was founded as a non-governmental organization in Vienna to encourage cooperation for developing moon programs and promote the dialogue between public and private actors engaging in lunar activities. They also come up with the principles for the governance of lunar activities as a guide for a future international regime on commercial and scientific lunar activities. At the moment the association has 220 individual and 29 institutional members from all around the world, and with the help of the members of the association, they published their first draft titled the 'Moon Village Principles' in February 2020 (The Moon Village Association, 2020).

Lastly, I would like to mention a third civil initiative which is a group of two dozen experts from governments, the space industry, and academia invited by the Outer Space Institute in early March 2020. The objective of this meeting was to draw up some principles to ensure the sustainability and the safety of space mining activities. The meeting took place at the Peter Wall Institute for Advanced Studies at the University of British Columbia in Vancouver, Canada, and at the end of the meeting, the group published 'Vancouver Recommendation on Space Mining' in April 2020 (Outer Space Institute, April 2020). This initiative furthermore wrote an open letter to the President of the General Assembly to draw attention to the need for an international regime for the exploration, exploitation, and use of outer space resources and asked the General Assembly to adopt a resolution which would request the UNCOPUOS to negotiate a draft multilateral agreement on the exploration, exploitation, and utilization of space resources (Outer Space Institute, August 2020).

In the table below, I provide the summary of these three proposals including their similarities and differences:

Similarities	Differences
<ul style="list-style-type: none"> ✓ The activities shall be carried for the benefit of all countries and humankind. ✓ They address all actors interested in space/lunar resource/mining activities. ✓ Development of an international framework or regime for the governance of space resources/lunar activities/space mining. ✓ Encouragement of both commercial and scientific activities relating to space resource/Lunar/space mining activities. ✓ Peaceful Uses of Outer Space/Safety and sustainability of space mining activities. ✓ Establishment of an international body/a system of governance. ✓ International responsibility of states for the activities of governmental and non-governmental entities. (Authorization and supervision of the activities) ✓ Liability/Legal accountability for the damages resulting from space resource/lunar/space mining activities. ✓ Registration of space resources/land use activities and/or sharing of information on the activities. ✓ Sharing benefits, <ul style="list-style-type: none"> - by all means (mentioned by the MVP), - through an international fund (mentioned by HBB and VRSM), - monetary (voluntary) benefit-sharing (Mentioned in the Building Blocks and VRSM). ✓ Protection of the space environment/avoidance and mitigation of harmful impacts/harmful interference. ✓ Protection of natural/cultural/historical sites. ✓ Settlement of disputes (proposed by the Building Blocks and MVP). ✓ Monitoring and review of the implementation of the proposed framework/principles. (Mentioned in HBB and MVP) 	<ul style="list-style-type: none"> • In general, the HBB includes more detailed provisions. It covers some provisions which are not specifically addressed in other documents, such as: <ul style="list-style-type: none"> ⇒ Definition of terms relating to space resource activities. ⇒ Jurisdiction and control over space resources. ⇒ Priority and resource rights. ⇒ Technical Standards for methods and operations of space resource activities. ⇒ Right to visit according to XII of the OST. ⇒ The establishment of safety zones around space resource activities. • MVP only addresses lunar activities as defined by the draft. • MVP also refers to United Nations Guidelines for the Long-term Sustainability of Outer Space Activities as a framework for the establishment of an international regime on lunar activities. • VRSM refrains to take a position on the Outer Space Treaty Article II. (non-appropriation principle) • VRSM states that the adaptation of national legislation on space mining is an inadequate response to the issue. • VRSM offers some methods to start negotiations on an international regime through the UN or <i>ad hoc</i> initiatives and so on. • VRSM refers to deep seabed mining as a model for space mining activities. • VRSM includes more detailed recommendations on planetary protection such as: <ul style="list-style-type: none"> • Application of COSPAR Planetary Protection Principles. • Investigation into whether the concept of planetary boundaries can be extended into Space. • Protection of biosignatures if encountered.
<p>HBB: The Hague Building Blocks for the Development of an International Framework on Space Resource Activities MVP: Moon Village Principles VRSM: Vancouver Recommendation on Space Mining</p>	

- Regulating space mining at the national level: The enactment of an international instrument and the establishment of an international governing regime for space mining are ongoing discussions in the international community, and we do not know when such a legal regime would be realized. It seems there is a long way to go. However, things are not that slow at the national level.

The first act on the domestic regulation on space mining came from the USA in 2015. The law called ‘Commercial Space Launch Competitiveness Act of 2015’ includes rights and obligations of US citizens on space mining in the fourth title. According to the act, US citizens are encouraged to engage in “*commercial exploration for and commercial recovery of space resources*”, and the ones who entered the business are “*entitled to possess, own, transport, use and sell the asteroid resources and space resources obtained*” (US Commercial Space Launch Competitiveness Act, 2015).

The second national legislation on space mining is the Luxembourgian Law of 2017 on the Exploration and Use of Space Resources. The law suggests that the space resources could be owned and should be explored and/or used under the authorization of Luxembourg, and the law further regulates a detailed regime of the space mining authorization process (Law on the exploration and use of space resources, 2017).

The third national legislation that mentions space resources is the Federal Law of the United Arab Emirates on the Regulation of Space Sector issued in 2019. According to the law, the exploration, exploitation, and use of space resources, including their acquisition, purchase, sale, trade, transportation, storage, and any space activities aimed at providing in this regard are allowed, and these activities should be performed with a permit obtained from the United Arab Emirates Space Agency (Federal Law, 2019).

- An intergovernmental initiative under the leadership of the USA to designate a set of principles to govern the exploration and use of outer space: Artemis Accords

Another hot topic regarding the legal regime of space mining is the Artemis Accords, which was proposed by the USA as legal cooperation for its Artemis program. The document aims to make a political commitment to the agreed set of principles, guidelines, and best practices to be applied to the Artemis Program as well as other civil activities performed by the civil space agencies of signatory states. This means signatory states should always take these principles into account before taking steps to perform any space-related activity, especially space mining. The document was signed by the USA, Australia, Canada, Japan, Luxembourg, Italy, the United Kingdom, and the United Arab Emirates on the first day of the International Astronautical Congress on 13 October 2020. Later Ukraine, South Korea, New Zealand, Brazil, Poland, Mexico, Israel and Romania joined the Accords (Foust, 2021; Foust, 2022).

The document accepts a set of principles on the exploration and use of outer space; however, we all know that the principles are mainly about exploration, exploitation, and use of space resources. And thus, Section 10 of the document acknowledges the utilization of space resources as a civil space activity and ensures that the utilization of space resources is for the benefit of humankind and performed in accordance with the OST. Furthermore, state parties to the accords aim to contribute to developing international practices and rules for the commercial use of space resources, including efforts in UNCOPUOS (The Artemis Accords, 2020).

In addition to Section 10, states also agreed on the following principles :

1. The civil space activities should be performed in accordance with the peaceful uses of outer space principles, and international law.
2. National space policies and plans of state parties should be transparent.
3. States should develop interoperable and common exploration infrastructure and standards for their scientific and commercial activities, such as fuel storage, delivery systems, landing structures, communications systems, and power systems, and so on.
4. All reasonable efforts should be taken to render necessary assistance to the personnel in outer space in the case of distress.
5. The signatories commit to determine which of them should register any relevant space objects being used for the space activities defined in the document.
6. The signatories retain the right to communicate and release information to the public relating to their activities, and they are committed to the open sharing of scientific data.
7. The signatories intend to preserve outer space heritage on celestial bodies.
8. The signatories are committed to the OST, including provisions relating to due regard and prohibition of harmful interference.
9. The signatories are committed to a plan for the mitigation of orbital debris, and so on.

Consequently, space mining has become a new sector in private space activities, and regulating it has become vital for the safety and sustainability of space activities. So far, the US has the leading role in regulating space mining in its domestic legal regime and also has started a dialog and political agreement with other nation-states on the utilization and use of outer space. However, as generally supported by the space community, we need an international instrument enacted in the UNCOPUOS through the participation of member states of the committee. The three proposals mentioned above would be helpful for the committee to start with.

5. Mars Colonization

The idea of going to Mars did not appear recently. Since the 1950's there have been a lot of proposed crewed human missions to Mars by the USA and the Soviet Union planned by public agencies or private companies. Back then the aim was to explore and conduct scientific research on Mars (Rapp, 2008; Genta, 2016). However, today going to Mars has gone beyond exploring the planet. The goal is eventually to create a new habitat for the human being, which means the colonization of Mars.

Colonizing Mars is not an easy task. It brings up technical, financial, and legal issues to be resolved. As for the legal issues regarding the colonization of Mars, applicable law on Mars missions, jurisdiction, control of launching states over space objects and ownership, resolution of civil and criminal cases, intellectual property, and environmental law are discussions that come to mind. However, I want to mention here a recent incident that has led us to question the governing law of Martian activities.

This incident is related to the new Space X project called Starlink. The project aims to set up a satellite constellation consisting of 1,440 satellites (eventually 42,000) and provide internet service to the entire planet in ten years. Since May 2019, the company has launched more than 800 satellites and has started to invite volunteers to test its Internet service. In the service contract, which participants signed, a clause took the attention of the space community (Williams, 2020).

Clause 9 titled Governing Law suggests *“for Services provided on Mars, or in transit to Mars via Starship or other colonization spacecraft, the parties recognize Mars as a free planet and that no Earth-based government has authority or sovereignty over Martian activities. Accordingly, disputes will be settled through self-governing principles, established in good faith, at the time of Martian settlement”*. In other words, users of the service are put in a position that they acknowledge Mars as a free planet.

The contract does not have an impact on US domestic law or international space law. However, it brought forward legal issues we might face in the future, after the settlement of Mars. Considering the wording of the clause the questions we ask are:

1. Is Mars a free planet?

The meaning of this question is if Mars, at the moment, is subject to any legal regime or not. The wording of the OST provides a legal regime in the exploration and use of outer space,

including the moon and other celestial bodies. In other words, the treaty governs all of the space activities of state parties on all celestial bodies. As the USA is a state party to the OST, the public and private actors operating under its authorization are bound by the treaty, as is SpaceX. Therefore, Mars is not a lawless area, and any activity on it is subject to space law (Salmeri, 2020; Eijk, 2020).

2. Does any Earth-based authority or sovereignty have over Martian activities?

The OST bans claiming sovereignty over outer space, including the moon and other celestial bodies. Therefore, Mars will not be under the sovereignty of any state. However, this does not mean that the states which will conduct activities on Mars do not have any authority over Mars.

According to the OST, states (state of registry) retain jurisdiction and control over the subjects launched into outer space (article VIII of the OST). In other words, the jurisdiction of the state of registry extends to any activity performed in outer space, as well as Mars. Therefore, it is contrary to the OST to declare that no Earth-based authority has authority on a Martian activity (Salmeri, 2020).

3. Would settlers have the right to self-determination at the time of the settlement of Mars ?

The Mars settlement is a private initiative, which needs license and authorization from the state where the relevant private company operates. Companies enjoy the freedom of use, and their activities are also limited according to the non-appropriation principle, peaceful uses of outer space, avoidance of harmful contamination, and interference. As the non-appropriation principle bans states to claim sovereignty over celestial bodies, it also bans private actors to declare independence and establish a legal system on their own (Eijk, 2020).

In conclusion, the current legal regime does not give the right to self-determination to the first settlers; they have to be under the jurisdiction of the state of registry and play the game according to the book written on Earth. However, I should also indicate that if humans are successful in surviving on Mars and if Mars eventually becomes a new habitat for human beings, there would be a time in the future that we discuss an autonomous legal regime and relationship between law on Earth and Martian law (Haqq-Misra, 2015).

6. Conclusion

It seems that the development of space technology and the development of the space sector has led to legal issues, which were impossible to anticipate 50 years ago. Therefore, we cannot find legal answers in the UN space treaties to the new legal questions related to developing space activities. We may use interpretation to expand the content of the UN space treaties, however as I tried to show above, it still does not suffice to provide regulation for certain topics. Considering all that I mentioned above, my conclusion is that the international community, especially the UNCOPUOS, has to step in to regulate certain activities and clear legal uncertainty on them. We will wait and see.

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