

Outer Space as a Global Common: Toward Tragedy or Governance

Constance Delaune¹

¹Università di Bologna

ABSTRACT

In recent decades, human dependency on outer space has grown while its exploitation has become increasingly complex due to the development of new actors and challenges. Through the legal framework of outer space, this paper wishes to analyse to what extent spacefaring actors cooperate in the management of outer space as a global common. After conceptualising the term global common, we will prove that space belongs to this legal category. Then, in a second part, using the principles listed by Ostrom in "Governing the Commons" we will see the mechanisms put in place to supervise the use of space. Finally, we will see the limits of the current governance of outer space, particularly on the subjects of the commercial exploitation of the moon, the management and accountability of debris, and the militarisation of space.

Introduction

With world hunger, poverty, disease, ecological disasters, and other global issues, the subject of space exploration in international relations can seem futile and superficial. Repeatedly criticised for the budget allocated to its research and the public attention it brings, space programs have a tough life. A recurring criticism is our obsession with sending humans into outer space, which is more expensive and time-consuming than robot lead missions. However, these criticisms are balanced by a universal human fascination for space. Though accelerated by space exploration, this interest goes back, long before Kepler. In many religions, space is a spiritual place like heaven or the residence of the gods; for example, in Roman mythology, celestial bodies were considered to be deities. It was also common to think that some skills such as star reading held divine power, enabling one to predict the future (Brünner & Soucek, 2012). In our contemporary societies, some parts of outer space are no longer out of reach, however, the fascination far from shrinking expands the more we learn about it. This fascination is also a source of inspiration for many artists. For example, numerous films were made about space, including blockbusters like Gravity or the current race, by several film companies to shoot their next movie in space.

Critics fail to see that outer space is more than a source of fascination, we exploit it daily. One of the most relevant examples is the Global Positioning System (GPS), initially a military device that now allows us to navigate almost everywhere using our phones. Satellites also provide images of the Earth, allowing us to predict and monitor natural or artificial disasters. In addition to these concrete examples, it is essential to note that research in one area often leads to innovation in surrounding fields. For instance, space research has led to many innovations such as wireless headsets and discoveries that improve human life, such as Magnetic Resonance Imaging, water purifiers, and survival blankets (Brünner & Soucek, 2012). Finally, the space shuttle being a closed space, space agencies are doing a lot of research on self-sufficiency and recycling, which can eventually be applied to the Earth's environmental problems (Grasset & Duval, 2021). Thus, the knowledge, travel, and exploitation of space are of paramount importance today. However, space is as much a place of opportunity as a place of extreme danger. These dangers are both natural, such as the hostile environment for both humans and equipment, with extreme temperatures, unidentified objects, etc., but also man-made threats, such as the presence of artificial debris that can damage the spacecraft (Brünner & Soucek, 2012). To these risks, we can add that specific space resources such as satellite orbit or radio frequencies are not

unlimited and that space, despite a recent dazzling technological development, is still challenging to reach, extremely expensive, and has a very high probability of failure (Brünner & Soucek, 2012). Apart from Russia, the United States, and China, no country is currently capable of sending a human into space from scratch. However, to be considered spacefaring nations, a satellite launch seems sufficient (Brünner & Soucek, 2012). Thus we have gone from 2 spacefaring nations to over 72 countries with space programs and 14 countries with launch capabilities (Cross, 2021). In addition, at the beginning of the 21st century, new space actors such as regional organisations (European Space Agency) and private actors (Space X) have multiplied. The diversity of actors, the difficulty of accessing the area, the scarce and non-appropriable resources, all these conditions lead to the question of how collective action and management of outer space is organised.

I - Global Commons

a) Common, Common Pool Resources, Public Good and Global Common

Commons and their management is a subject covered by many scholars. Ostrom (1990), a reference in the field, defines a common as "a natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use." (Ostrom, 1990, p.29). Thus, we can find Common-Pool Resources (CPR) in the commons. These common pool resources, Ostrom defines them using two different concepts. The resource system, which is the capacity of the resource pool to vary, and the resource unit, which represents the resources used by humans. It should be noted that a common has the particularity that any improvement, maintenance, or construction made by "producers" cannot be of exclusive use.

When talking about commons, the question of ownership comes up a lot. In Ostrom's definition, the property is described as "hard (if not impossible) to exclude potential beneficiare." Shepsle (1996) explains that the commons belong to everyone. Bo Min Kim (2014) defines a crucial difference between a shared property and an ownerless property, the last one being subject to appropriation. In the end, these blurred ownership rights often lead to governance problems. As Shepsle says, "A common is, by definition, owned by everyone, and therefore is the responsibility of no one." (1996, p.335)

Also, when trying to understand commons, one must be wary of their similarity to public goods. Taking Shepsle's work, on one hand, we can see that a good is public if it is non-excludable and non-rivalrous. On the other hand, a common can be in some cases considered non-excludable because it is difficult to ban people from using it, but it is not non-rivalrous: if a user fishes too much in the shared pool, less fish will be left for others. Unlike the common, a public good cannot be overused (Ostrom, 1990).

Taking the above definitions, space does not fit neatly into any of them. The problem is not the conceptualisation of the term common but the fact that the space belongs to a particular type of common. Indeed, like international waters, space is a global common. As opposed to a common, a global common calls for exploitation of the size of states and not of the individual. Bo Min Kim defines the concept as "resource domain or areas which no nation exercises sovereignty over." (2014, p.1). However, the ownership problems of a global common are more complex than those of a common because the exploiters of the domain resources are states, not individuals. Thus the problem of ownership becomes a problem of sovereignty over the geographical area where the domains are located. Here, the difference between unowned resource domains and the domain under the international community's sovereignty, presuming partial sovereignty of each state, has consequences. For example, all parties are entitled to have decision-making power in the case of joint sovereignty, but only states capable of exploiting the resource could claim a right to decide over ownerless lands. (Soroos, 2001 seen in Neto, 2021, p. 3) In the end, less than a legal problem, this difference is more a tool of justification used by certain states to advance their agenda. For instance, developing countries often adopt the image of joint sovereignty to have more weight and legitimise their place in the discussions even if they do not possess a space program.

Finally, although both are common at the state level, one should not confuse a global common with an international common. The difference is that while all states have access to it in the case of Global commons, and it can hardly exclude anyone, the international commons implies a notion of exclusivity where only certain states have access to its resources (Buck, 2017).

b) Is space a Global common?

What about space? Through the history of outer space exploration and international laws, we will prove the non-sovereignty of states over outer space and its status as a Global Common. Although interest in space is timeless, we will focus on the beginning of space exploration, around the 50s and 60s. The definition of space activity encompasses everything that takes place in space, be it robotic or human missions (Brünner & Soucek, 2012). Indeed, a common being defined by the resources it offers, it is not easy to analyse outer space status during a time it was not yet reachable. However, it is worth noting that as early as 1950, when space was still untouched by human intervention, the International Astronautical Congress took place and already outlined the idea of space as a space shared by all humanity (Brünner & Soucek, 2012). In 1957, Sputnik 1 took off and became the first artificial satellite in Earth orbit. This event was a catalyser or what we also call a Grotian moment which is "a time in which a fundamental change of circumstances (creates) the need for a different world structure and a different international law." (Röling, 1990 cited in Buck, 2017, p.2) In the same year, the International Geophysical Year conference was held, bringing together more than 67 countries sharing again the desire for a joint sovereignty of space.

As we can see, the 1950s was the year when space and other global commons such as the high seas began to be seen as commons and not as ownerless land. This shift of status can be explained by the exclusivity that developed countries, in the case of space, the United States, and the USSR, had in the capacity to reach the commons and potentially exploit it. The pre-1950s status would allow any country reaching space to try to take the property over it (Kim, 2014). Thus, at the Grotian moment, states lacking the technological and economic means to reach or exploit space called for "a joint management system of global commons outside national jurisdiction under the global governance regime of the UN" (Kim, 2014, p.5) creating, therefore, the global commons. Therefore, mostly third-world countries pushed the concept of global commons, fearing that the cold war would directly affect these common pool-resource areas.

The first satellite in orbit resulted in a declaration by the United Nations General Assembly, which in December 1958 adopted its first-ever resolution on space, declaring it the common interest of mankind. In 1966, the United Nations produced the "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies", or for short Outer Space Treaty. In this treaty, many articles refer to space being a global common. Thus in article 1, paragraph 1 of the treaty, it is noted that all the world, all states have a common interest in space. Paragraph 2 supports the principle of freedom but above all of non-exclusivity of space: "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." (Resolution 1962 (XVIII)) Thus each state is guaranteed equal rights to space and must allow others the same rights. Finally, Article II of the Outer Space Treaty supports the principle of non-appropriation and non-sovereignty of states over space: "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." (Resolution 1962 (XVIII)) This treaty ratified today by 111 states and adopted by the United Nations General Assembly is the legal proof of the status of space as a common.

Another way to declare outer space as a global common is to compare it with another established and largely consensual global common. Several other global commons exist as Buck (2017) states: "By constituting a domain of resources to which all nations have access, but over which none has the right to claim sovereignty, outer space can be understood as an example of a global commons - in the same way as the high seas, the deep sea and Antarctica" (p.6). Despite what one might think, space is quite different from air space, for example, they do not share the principle of

sovereignty of the air above the state. By their similarity, space is more comparable with high water (Brünner & Soucek, 2012). Indeed, they are dangerous places where nature is hostile, outside state territorial jurisdiction but accepting freedom of transit. Several laws between both global commons are similar, such as the obligation to identify any object going into space or onto the sea. Thus, the similarity of space to another established global common proves its status as a global common once again.

However, even if we have proven that space is a global common through legal instruments and comparison, controversies around its status remain. One example is the United States, which in 2020 declared that it does not recognise outer space as a global common. This statement was released in parallel to the NASA Artemis Lunar Exploration Program. (Neto, 2021) Thus, most of the defiance against outer space as a global common is motivated by commercial interests. Therefore, we need to understand that even if space is now seen as a global common under the governance of the United Nations, this does not prevent potential problems of governance or over-exploitation.

II - Governing Outer Space

Now that we have proved that space is a global commons, it is time to ask ourselves how the actors manage and supervise this territory.

a) How to avoid a tragedy?

Extensive literature exists on the institutional and management problems of the commons. The management of any common is by definition complicated as it is characterised by great uncertainty about the resources present, about the actions of other actors, and a significant problem of free-riding exists, i.e. getting a benefit on someone else's struggle without making an effort (Shepsle, 1996). As Ostrom (1990) illustrates, the literature on commons mainly comprises pessimists who see every common as a ticking bomb waiting to implode. From Aristotle to Hardin, commons always seem to end in tragedy where all domain resources are siphoned off. Illustrated by the prisoner's dilemma, where cooperation while maximising the benefit is not possible due to uncertainty, common seems untamable to scholars. However, for Ostrom, this view of the commons is limited. After analysing and comparing various commons, she comes up with a set of 8 principles to create a framework of management that is efficient and sustainable. These objectives are as follows (Ostrom, 1990, p.69):

- 1 - Clearly defined boundaries
- 2 - Congruence between appropriation and provision rules and local conditions
- 3 - Collective-choice arrangements
- 4 - Monitoring
- 5 - Graduated sanctions
- 6 - Conflict-resolution mechanisms
- 7 - Minimal recognition of rights to organise
- 8 - Nested enterprises

We are thus tempted to analyse the management of outer space through these principles. However, it should be noted that the case studies used by Ostrom in "Governing the common" include only small Common Pool Resources with renewable resources. On the other hand, outer space is the largest commons known to humankind today, and some of these resources are non-renewable, such as satellite frequencies and orbital allocations. However, as stated by Buck (2017), the principles described by Ostrom are still relevant when analysing outer space.

b) Is cooperation even possible?

Before using Ostrom's principles, another difference between the examples of commons used by the scholar and outer space is worth noting. Ostrom deals with actors who are individuals who have no particular grudge or conflict before governing the common in cooperation. In the case of space, the actors are states or international organisations. The very nature of international relations is conflictual. Realism, one of the main theories of International Relations, illustrates this violent state of nature by describing states as drive-by power and war. Also, for many scholars, the international stage is a place of anarchy where international organisations, far from being at the top of the hierarchy, do not matter. Thus, working with states that are almost free agents under no law is a challenge when it comes to joint governance. This challenge is even more remarkable when one considers the beginning of space exploration in the middle of the Cold War. Considering the context, it is essential to see historically if cooperation regarding outer space was even possible before analysing any joint governance of the global common.

As seen above, outer space, by its extreme condition, is by definition a place of cooperation. This cooperation characterises the whole space-age. Outer space exploration began with the USSR launch of Sputnik 1 in 1957: Many people pinpoint this event as the trigger of the space race between the United States and USSR. However, this race was partially constructed by the media : "When it came to Sputnik, it took a concerted effort on part of the media and those opposed to the Eisenhower administration to turn awe into panic." (Cross, 2021, p.392) Repeated spatial cooperation between the United States and the USSR proved that part of the tension was manufactured. For example, the Dryden-Blagonravov agreement in 1962 will allow both states to share meteorological data and launch meteorological satellites. To say that no tension existed between the USSR and the United States would be false, but to say that no cooperation existed would be a lie, as illustrated by the moon race between the two countries. On several occasions, the goal of putting a man on the moon was considered a joint project between the USSR and the United States, with, for instance, the 1969 Kennedy proposal of a joint moon landing (Cross, 2021). In the end, the 1969 lunar landing was American; however, it is essential to note the international character of this project. As far as the USSR is concerned, the United States sent two USSR astronauts' medals on the moon, and US-Soviet coordination took place to secure the spacecraft's journey to the moon. It is also worth noting that the first scientific projects on the moon were Swiss, and the first images were Australian. Thus, the moon landing is a testament to the highly collaborative aspect of any space operation, which is often too colossal to involve only one state.

The end of the Cold War has brought about the most prominent international project in space today, the International Space Station. The International Space Station collaborates with more than 15 countries that signed the Intergovernmental Agreement (IGA) in 1998. This cooperation involves scientific experiments from different countries and international crews. For example, Italy, offering research under the European Space Agency, has developed for the International Space Station three modules named Leonardo, Raffaello, and Donatello. Today, the ISS comprises Russian, US, European, and Japanese modules and produces scientific data for more than 800 scientists worldwide (Brünner & Soucek, 2012). Thus, cooperation is more than necessary in space and calls for joint governance of outer space.

c) Legal instrument to govern

Now that we have seen that cooperation between states is indeed possible in space, we will try to distinguish Ostrom's eight principles through space law and state practices.

Like all international laws, space law is complex because of the multitude of actors involved and the scope of influence of these texts; however, some additional complexity arises when discussing space law. Indeed, the threshold between what concerns and does not concern the outer space domain is often blurred. For instance, Brünner and Soucek (2011) mark the difference between the upstream sector concerning the market using terrestrial resources for outer space like launchpads and the downstream sector for the market using space resources for terrestrial services like the satellites. Space is a place where many different practices take place, such as science, telecommunication, and

space exploration. As a result, everything related to space is extended in many different domains, with, for example, part of satellite telecommunication being regulated by the International Telecommunication Union (Brünner & Soucek, 2012). In response, because of its multitude of actors and subjects, Francis Lyall and Paul Larsen (2009, seen in Brünner and Soucek, 2011, p. 235) compare space law with environmental law, which is not a cohesive set of law in itself but a grouping of various "subcategories of law."

Outer space is a global common, thus space law is made at the international level, the leading actor being the United Nations. Of course, other actors are also important, such as UN Specialised Agencies (Committee on the Peaceful Uses of Outer Space), regional organisations (European Space Agency), or national governmental entities (NASA), but on account of its central role on the international stage, we will focus on the United Nations. There are five treaties on space made by United Nations General Assembly. The first one, the 1967 Outer-Space Treaty, was quickly followed by four additions and clarifications on topics such as liability and astronaut rescue. It should be noted that other sources of international law, like the UN Charter, are also applicable to outer space.

Clearly defined boundaries

Because of its vastness and our limited knowledge, it is complicated to define the limits of outer space. The first boundary to be defined is between what is considered air and outer space. This boundary will also determine geographically where air law applies and where space law applies, which is fundamental since air law applies the principle of sovereignty. In practice, a theoretical limit called "Karman line theory" or "aerodynamic lift theory" states that everything above 100km above sea level can be considered as space. Although not legally binding, this limit has been adopted by the Federation Aéronautique Internationale. This boundary is, however, by no means legally clarified (Brünner & Soucek, 2012).

Finally, finite or infinite, despite the multitude of scientific theories, we do not know the limits of space. However, the term outer space used in a legal context refers only to the area of the universe to which humans have access, so in our case, not very far. It should be noted, as the full title of the Outer Space Treaty, which is "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies", indicates that outer space law does include celestial bodies present in space (Brünner & Soucek, 2012).

Congruence between appropriation and provision rules and local conditions

The limitations on the appropriation of outer space relate primarily to sovereignty and nuclear weapons (Resolution 1962 (XVIII)). These limitations are in line with the provision rules. Then some other limits exist, like geostationary satellites or radio frequency limits. These limits are more complicated to manage because very few countries have the manpower, materials and money to go to space (Brünner & Soucek, 2012). Thus, many limited resources such as geostationary space are mostly appropriated by a few countries. As a result, an imbalance is formed and forces most countries to depend on satellites of other countries. In conclusion, the congruence between appropriation and provision rules is complex to balance because of the technological asymmetry in the world.

Collective-choice arrangements

In addition to being a global common, space is also, as we saw earlier, a multiple-use commons. In the case of these particular commons, Ostrom (1990) goes beyond the collective-choice arrangements and advocates three new principles:

1. Resource domain must be able to support all uses: although many variables remain unknown, we can say at this point that the space is well capable of supporting multiple-use.

2. All users must be represented: The multitude of spacefaring actors makes it complex to represent them all; however, legal decisions are taken at the level of the United Nations, where all states are represented. Commercial companies are represented at the state level to which they are linked, e.g. Space X linked to the US. Also, it should be noted that treaties are accepted by consensus, and then states decide whether or not to sign/ratify them.

3. Knowledge of operational rules must be shared: Operational rules are not only shared by all through legal texts in the treaties but must be known by all States.

Finally, as Article XV of OST states, "Any State Party to the Treaty may propose amendments to this Treaty". As an all, outer space management is a matter of collective choice where everyone has an equal voice.

Monitoring

Unlike in the case of high seas, where even if a ship sails illegally, it will be obliged to return to port at some point, this is not the case for objects launched into space. So monitoring before launching an object is crucial. An advantage of launching into space is that, unlike a ship leaving port, it is more visible and predictable (Brünner & Soucek, 2012).

In 1975, the UN signed "The Convention on Registration of Objects launched into Outer Space". This treaty mandates the registration of any object launched into outer space through a register held by the UN. In the way that a ship on high seas must carry a flag, Article IV of the OST says

"Each State of registry shall furnish to the Secretary-General of the UN, as soon as practicable, the following information concerning each space object carried on its registry:

- Name of launching State
- An appropriate designer of the space object or its registration number
- Date and territory or location of launch
- Basic orbital parameters."

It should be noted that despite the high cooperation in space, only one state can register an object, to avoid liability problems. It can also be added that in article XI of the OST, signatory states are requested to inform the Secretary-General and the public of the feasibility, nature and results of space activities.

Graduated sanctions

Two types of sanctions can be applied in the case of space law. The first is when a country does not respect the treaties it has ratified. The Treaties on the use of outer space are legally binding, which means that they have legal effect and must be obeyed; otherwise, a punishment is applicable. The United Nations, which created most of the outer space treaties, has its own system of sanctions, primarily enforceable by the Security Council. Sanctions "ranged from comprehensive economic and trade sanctions to more targeted measures such as arms embargoes, travel bans, and financial or commodity restrictions." (UN, 2022) These sanctions are, therefore, gradual and aim to maintain peace. However, it should be noted that the countries with a permanent seat on the Security Council and, therefore, the right of veto are also those that are the most active in space. Thus this sanction mechanism, although present, is limited.

The second type of possible sanction is in the case of an accident causing damage to a state or the space property of a state. These sanctions are covered by the 1975 Convention Liability for Damage Caused by Space Objects. This treaty claims that the state registered in the registry for a space object is liable for any damage it may cause. The state registered must therefore bear any damage caused to a third state. In the case of an accident, two liability regimes exist the regime of absolute liability, where it is difficult to distinguish a fault and the regime of fault-based liability where the fault is clearly identified ().

Conflict-resolution mechanisms

The United Nations is itself an organisation with diplomatic conflict-resolution mechanisms. It also often represents neutral grounds for negotiation. Also, as seen earlier in 'Convention Liability for Damage Caused by Space Objects', liability mechanisms are put in place so that legal conflict resolution mechanisms are in place in case of accidents.

Minimal recognition of rights to organise

Although United Nations laws prevail, regional organisations and national agencies exist. They are not prohibited as long as they respect the treaties signed.

Nested enterprises

With the variety of issues and topics in space, from telecommunication to science, the United Nations has created various sub-organisations such as telecommunication or COPUOS. Also, many other organisations exist at the international, regional and national level.

Thus, space law and space practice fulfil the conditions set by Ostrom for the efficient use and exploitation of a common over a long period. However, unlike other common laws such as the high sea, where years of practice have forged the current laws, space laws were formed during the first space explorations. It resulted in a regulation of the field in general terms to have the broadest consensus when technology limited the vision into the future. Today, problems of interpretation and application exist, and governance faces many challenges that can disrupt the management of the common.

III - Limitation in the governance of Outer Space

Thus, we have seen that despite a strong coherence between Ostrom's eight principles of governance of a common and the governance of outer space, some blindspots in space law limit its application in some domains. These limits come in particular from the very young age of space law and the fast paced technological advancement. Through three examples, we will observe the limits of the current governance of space.

a) The Moon: Treasure of Humanity or commercialisation

The moon has always been central to space exploration. At the heart of the space race during the Cold War, its visibility from Earth makes it a tantalising object. This fascination is attractive not only to scientists but also to entrepreneurs. The Moon today represents one of the major places of potential space commerce. Space business took off in the 80s and 90s, at the end of the Cold War when countries could no longer afford to pay for space activities on their own. The privatisation of the space sector is mainly a response to the demand for funding, which is increasing with new technology. As a result of the privatisation, the commercialisation of outer space started to blossom (Brüner & Soucek, 2012)

Three types of space resources that are marketable: Earth Orbits, In-Situ Resource Utilisation and Space mining. The moon faces three types of possible commercialisation:

- 1 Mining
- 2 Militarisation
- 3 Tourism

The problem with the commercialisation of the moon is that no governance or organisation is overseeing these activities. The 1979 Moon Treaty is extremely vague. For example, it prohibits the possession of "natural resources in place", but this does not apply to extracted resources, so to resources mined. Furthermore, only seven states have ratified this treaty leaving out countries that have the capacity to exploit the moon. For example, the United States, which is not a signatory to the treaty, declared in 2015 in its "US Commercial Space Launch Competitiveness Act" that its citizens could appropriate space objects. (Neto, 2021) The exploitation and commercialisation of the moon also raise the question of possible property rights. Property rights are linked to sovereignty, but if space is not a place where sovereignty can be exercised, how can anyone legally claim anything in space? (Buck, 2017)

Faced with this slim legal framework on space commercialisation by spacefaring nations, less developed states declare the moon as the "common heritage of mankind". This declaration, present in the Moon Treaty, is the same for the deep seafloor. Although not recognised by the entire international community, this nomination would allow the preservation of the moon. However, as explained earlier, this treaty is a brake on the development of space commerce and therefore is not widely accepted (Neto, 2021).

Faced with this problem of governance of the commercialisation of the moon, some scholars such as Susan J. Buck (2017) put forward the idea of a separation of the planetary policy and the outer space policy. We can conclude that the status of the moon and especially of space marketing is far from being sealed and that many decisions remain to be made. However, this hole in the law may create problems later on in managing the global common when the technologies allow states to exploit the celestial bodies.

b) Debris: Earth's deadly rings

Another blind spot of the current governance of space is the question of debris. Today, there are more than 50,000 pieces of debris in the earth's orbit which are extremely dangerous both for mission lead in outer space and on earth. In space, debris can damage satellites and be dangerous for astronauts. On Earth, debris can be toxic, for example, the Cosmos 954 satellite disintegrated and caused radioactive debris to fall on Canada (Buck, 2017).

Debris has various origins, such as spaceship parts and old satellites. Some are in orbit voluntarily, like the Wes Ford Project in 1961, which launched debris into orbit. Also, when China and India blew up their satellites, it created a lot of debris (Buck, 2017). The regulation of debris creation is severely limited. If a direct causal link is seen, then the Liability Treaty can be used to seek punishment. However, today there is no universal agreement accepted in the control of space debris.

The question of debris, whether it be tracking, limiting or potentially punishing its creator, remains to be answered. Keeping space debris under control and to a limited number is a question of the sustainability of outer space, and this long-term sustainability is a problem that concerns all countries, as outer space is a global common. The inability of the international community to find solutions could ultimately lead to a disastrous accident or render outer space or at least Earth orbit untenable.

c) Militarisation and security: Toward a Space War ?

The beginning of space exploration had a strong military influence. This is evidenced by many space-based inventions such as GPS, which before being used by civilians, was designed for military use. However, almost all space treaties describe space as a place of peace, for instance, it is forbidden to place nuclear weapons in orbit. (Article IV, OST). However, as we can now understand, these treaties are vague, and although they promote peace, they possess many loopholes, where they allow the presence of weapons in space or space military forces.

One of the main limitations of the current treaties comes from the dual-purpose technology that is sent into space. Dual-purpose technology can serve both military and civilian purposes, such as earth observation satellites (Brüner & Soucek, 2012). The existence of these technologies limits the monitoring of space activities. Another

limitation comes from the wording of these treaties, which allows Reagan's Strategic Defense Initiative to be perfectly legal because technically, it is a defensive project that does not use weapons of mass destruction (Buck, 2017).

Today, as Tronchetto (2013, seen in Neto, 2021, p.7) says, even if space is subject to the same war and peace treaties as on earth, no special international legal treaty exists to regulate its military activities. In 2014 two resolutions from the United Nations named the Prevention of an Arms Race in Space (PAROS) Treaty to prevent states from sending weapons in orbit. However, due to many refusals, especially from the United States and leading spacefaring nations, these treaties have little weight in space peace-making. Thus, through its slow but present militarisation, space as a global common is being put to the test. The presence of weapons in orbit puts the proper management of space by the international community at risk. Finally, militarisation is very difficult to monitor because of dual technologies, creating tensions between countries and problems of uncertainty.

Conclusion

To conclude, outer space is a global common, i.e., a space that belongs to no one, where certain resources are limited and where a common management of the actors exploiting it is necessary. Faced with the uncertainty and dangers of outer space, collective action is necessary, but cooperation between states is more complicated than cooperation between individuals. However, since the early days of space exploration, states through the United Nations and five treaties have succeeded in establishing a sustainable system for managing space. This legal framework defines limits, punishments, settlement mechanisms and allows all stakeholders to participate. However, as this system is still young and technology is evolving rapidly, loopholes exist. Three issues in particular are crucial for the future of outer space and are yet to be answered. The moon and its commercialisation risk creating an ecological disaster and a trade war. Debris that could have serious consequences both on earth and in space. Finally, the militarisation of space could make space not a place for cooperation but for war. Thus, although space is currently under common international management, this balance is now being challenged and new treaties will have to be ratified.

References

- Bonchek, M. S., & Shepsle, K. A. (1996). *Analyzing Politics: Rationality, Behavior and Institutions* (New Institutionalism in American Politics).
- Brünner, C., & Soucek, A. (Eds.). (2012). *Outer space in society, politics and law* (Vol. 8). Springer Science & Business Media.
- Buck, S. J. (2017). *The global commons: an introduction*. Routledge.
- Cross, M. A. K. D. (2021). Outer space and the idea of the global commons. *International Relations*, 35(3), 384-402.
- Ireland, N. (1967). *Treaty on principles governing the activities of states in the exploration and use of outer space, including the moon and other celestial bodies*.
- Kim, B. M. (2014). *Governance of the global commons: the deep seabed, the Antarctic, outer space*. KIEP Research Paper No. World Economic Update-14-29.
- Neto, O. D. O. B. (2021). *Outer space as a global commons and the role of space law*. In *A Research Agenda for Space Policy*. Edward Elgar Publishing.
- Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge university press.
- Roberts, D. (1988). *Space and International Relations*.
- UN. (2022). *Sanction*. <https://www.un.org/securitycouncil/sanctions/information>