Reinvigorating the United Nations

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Chapter 5

Sustainability of Outer Space Activities

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5 Sustainability of Outer Space Activities

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Introduction

Why is 'space law' a topic in the context of reinvigorating the United Nations? It may be surprising that the term 'outer space' appears 25 times in the report of the Secretary-General on *Our Common Agenda*, in which he proposes a Summit of the Future (United Nations Secretary-General, 2021). This has to be seen in the context that the United Nations, since the beginning of the space age in the late 1950s, has discussed legal and technical aspects of the exploration and use of outer space. The relevant institutional foreground is composed of the five UN treaties on outer space, of which the Outer Space Treaty of 1967 is the most prominent. Furthermore, there are several UN bodies dealing with outer space, above all the UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS), with its two subcommittees (Scientific and Technical Subcommittee and Legal Subcommittee), and the UN Conference on Disarmament in Geneva, which deals with questions of military use of outer space. Finally, we need to mention the International Telecommunication Union (ITU), the specialised UN agency for information and communication technology, which provides the framework for the coordination of frequencies and orbital slots.

These foreground institutions developed at the time of the Cold War, which was characterised by the competition between the then two superpowers, the United States and the Soviet Union. The two states developed their space capabilities to demonstrate technological, economic, and ideological superiority, which led to the so-called space race. The actorness of mainly two powerful space-faring nations competing against each other is found in the background. This background, however, has changed significantly. Today, the use of outer space is no longer dominated by two powerful states but is characterised by the existence of a large number of different space-faring nations of different sizes and capabilities. Another significant change relates to the addition of non-state actors. In the past, space activities were almost exclusively carried out by governments. It was hardly conceivable that private entities could dispose of the financial and technical means to engage in activities in outer space. This has changed too. Today, private companies play an increasingly important role in the exploration and use of outer space. With them, the rules of the game

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change. In the past, outer space was primarily explored and used for governmental purposes. This included the military use of outer space but also civil purposes, such as the advancement of science and research. The realisation of financial returns was not envisaged. Nowadays, by contrast, commercial interests have become increasingly important and are a significant motivation for engaging in space activities.

These background changes are also present in other areas in which the United Nations is active. Most importantly, in the preservation of the environment and combatting climate change, the number and diversity of actors, in addition to the increasing role of private investment and commercial interests, face similar challenges.

For the area of outer space, the 'Summit of the Future' needs to address the evolving background and reconcile it with the existing foreground institutions, which are certainly not outdated per se. While they could most probably no longer be created in this form, as experts agree, they still have great potential for the future. For the safe and sustainable use of outer space, it is necessary to use the foreground institutions of the past in front of the changed background of today and, as much as possible, to adapt them to the potential new challenges of the future.

The Legal Framework – The Five UN Treaties on Outer Space

After the first satellite, Sputnik 1, was launched by the Soviet Union in 1957, the General Assembly agreed on the establishment of a Committee on the Peaceful Uses of Outer Space (UNCOPUOS), which should report on the 'nature of legal problems which may arise in the carrying out of programmes to explore outer space' (United Nations General Assembly, 1958).

The work under this mandate resulted in the 'Legal Principles Declaration,' which was adopted by the General Assembly in 1963 (United Nations General Assembly, 1963) and which formed the basis for the subsequent 'Outer Space Treaty' (Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967), adopted by the General Assembly in 1966, opened for signature in 1967 and entered into force in the same year. As of 2023, the Outer Space Treaty has 113 state parties, among which all of the major space-faring nations (UNOOSA, 2023).

The Outer Space Treaty forms the basis of international space law and is still the most important foreground institution of the governance of outer space. It contains the fundamental legal principles of space law, such as the freedom of use (Hobe, 2009), the prohibition of appropriation of outer space and celestial bodies (Freeland and Jakhu, 2009), the responsibility of states for activities carried out by governmental agencies and non-governmental entities (Gerhard, 2009), liability of the launching state (Kerrest and Smith, 2009), jurisdiction and control of the state of registry (Schmidt-Tedd and Mick, 2009), the applicability of international law and the UN Charter to activities in

outer space (Ribbelink, 2009), the principles of non-discriminatory use and due regard, as well as the prohibition of environmental degradation (Marchisio, 2009). These legal principles are largely considered to reflect customary international law so that also states that have not ratified the Outer Space Treaty are bound by them (Lyall and Larsen, 2018; von der Dunk, 2015; Soucek 2011).

This is different from the four subsequent treaties, which UNCOPUOS has brought forth, namely the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement, 1968), the Convention on International Liability for Damage Caused by Space Objects (Liability Convention, 1972), the Convention on Registration of Objects Launched into Outer Space (Registration Convention, 1976), and the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement, 1979). These treaties contain more specific rules and are generally only binding upon states which have ratified them. With the exception of the Moon Agreement, the UN space treaties are well accepted and have been ratified by many countries, including all of the major space-faring nations.[1]

This 'era of treaty making' in the 1960s and 1970s was characterised by the background of only two existing space-faring nations, the United States and the Soviet Union, and the competition between them in the so-called space race (von der Dunk, 2015; Soucek 2011). The two states were almost alone in this endeavour because other states did not have the respective economic, technological, and political means. The launch of rockets involved high risks of uncontrolled explosions, damage, and loss of life (von der Dunk, 2011). The operation of space objects, communication, and navigation of satellites required highly specialised education and training. The decision to engage in space programmes was taken at the governmental level, and the necessary funds came from the taxpayers. Engagement in military and civil use of outer space was considered a matter of national pride and achievement. If something went wrong, the state was ready to bear the consequences, even if potentially confronted with high damages claims.

This, however, changed subsequently because other states, most importantly Japan, Canada, the European states organised in the European Space Agency, and others entered the scene. Developing countries also had an increased interest in the use and exploration of outer space and demanded rights and benefits. Consequently, UNCOPUOS turned to the development of 'Principles Resolutions,' which responded to new technological developments and addressed more specifically the concerns of non-space-faring nations (Soucek, 2011; Lyall and Larsen, 2018). These resolutions are not legally binding but represent 'recommendations' to member states and are often referred to as 'soft law' instruments (Marboe, 2012). Between 1982 and 1996, the UN General Assembly adopted the 'Direct Broadcasting Principles,'[2] the 'Remote Sensing Principles,'[3] the 'Nuclear Power Sources Principles,'[4] and the 'Space Benefits Declaration.'[5]

Further technological progress and the increased privatisation and commercialisation of space activities raised new legal questions (Walter, 2011). Three

UN General Assembly resolutions contain recommendations in this context – namely, the 'Launching State Resolution,'[6] the 'Registration Practice Resolution,'[7] and the 'Resolution on National Space Legislation.'[8] These resolutions are addressed to states, reflecting the background that states are the main actors and, therefore, also the primary addressees of norms governing the use of outer space. Yet, increasing privatisation and commercialisation of space activities since the turn of the millennium calls this assumption into question.

New Proposals for a 'Space Traffic Management'

In the last 30 years, private companies have increasingly entered the scene (Venet, 2011). The commercial viability of certain space applications, most importantly telecommunication via satellites, became apparent, and, as a consequence, private companies began to order, buy, and sell satellites and provide services to their customers on a commercial basis (Walter, 2011). In contrast to states, they can go bankrupt, which may leave victims of accidents without compensation. Insurance may be one option, but it has its limits and is not easily available for new technological activities (Gaubert, 2015).

In front of this background, the Secretary-General, in his report *Our Common Agenda*, proposes to move towards a global regime to coordinate 'space traffic' for the future governance of outer space activities (United Nations Secretary-General, 2021: 62, 66). In his policy brief 'For All Humanity – The Future of Outer Space Governance' (United Nations Secretary General, 2023), the Secretary-General recommends looking at the *2023 Report of the High-Level Advisory Board on Effective Multilateralism* (United Nations High-Level Advisory Board on Effective Multilateralism, 2023), which encouraged governance bodies to increase the use of procedures that more effectively include external experts in member state discussions. An inclusive involvement of private-sector actors could ensure that technology advancement and operational requirements are duly taken into account.

The policy brief identifies four space-based challenges – namely, (1) space traffic coordination, (2) space debris, (3) resource activities, and (4) prevention of conflict in outer space. It concludes with a number of 'Recommendations' to member states and to UN entities. For the development of a new framework for 'space sustainability,' two options are proposed:

- Option 1, to develop a unified regime for space sustainability within the United Nations, most importantly the UNCOPUOS in cooperation with other relevant bodies of the UN system. This regime should also provide a platform for broader operational stakeholder inclusion.
- Option 2, to develop different governance frameworks for various areas of space sustainability. These could lead to mutually reinforcing instruments, also developed within UNCOPUOS and in cooperation with relevant UN bodies, and incorporate a platform for broader operational stakeholder inclusion.

The term 'space traffic' first appeared in studies published by the IAA (International Academy of Astronautics, 2006, 2018). These studies have identified the need for a global approach to address the risks of collisions and damage caused by space objects and have developed proposals for comprehensive space traffic management regimes. The IAA studies try to transition from a merely technical system, or the coexistence of different national systems, to an international *legal* regime of space traffic management. Significantly, and in line with the two 'options' presented by the Secretary-General, the most recent study, entitled 'Space Traffic Management – Towards a Roadmap for Implementation,' proposes two alternatives: (1) a gradual bottom-up approach, linking existing systems, or (2) a comprehensive top-down approach creating a common new frame for the regulation of human activities in outer space (International Academy of Astronautics, 2018).

The Secretary-General seems to prefer alternative (2), as his policy brief mentions the 'top-down approach' as Option 1 – namely, to develop 'a unified regime for space sustainability within the United Nations, most importantly the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) in cooperation with other relevant bodies of the United Nations system.' The IAA is more pragmatic, pointing out first, with alternative (1), that 'elements existing today, contained in instruments of different nature (whether legally binding or non-binding, technical or political) have the advantage that they tackle pressing issues; they may constitute the building-blocks of an STM system emerging from single fields of regulation, constituting a classical bottom-up model.' (International Academy of Astronautics, 2018). Also, the Secretary-General sees benefits in the 'bottom-up approach,' as in his Option 2, different governance frameworks for various areas of space sustainability could lead to mutually reinforcing instruments and incorporate a platform for broader operational stakeholder inclusion.

Alternative (2) of the IAA and Option 1 of the Secretary-General, the comprehensive top-down approach, is highly ambitious. The IAA proposes three different layers of regulation: (1) A unified, legally binding corpus of fundamental principles on the status of outer space and the status of actors in outer space, with permanent character; the Outer Space Treaty would have to be replaced, for example, by a new 'Outer Space Convention (OSC)'; (2) provisions for regulating space traffic, which should be binding but offer the possibility of review and, when necessary, revision on a regular basis; this set of rules could be termed 'Outer Space Traffic Rules (OSTR)'; and (3) technical standards, which do not have the same legal status as the Convention and the Rules and which are developed by states or by non-governmental entities; they could be termed 'Outer Space Traffic Technical Standards (OSTTS)' (International Academy of Astronautics, 2018).

It is difficult to deny that alternative (1), corresponding to the Secretary-General's Option 2, seems much more realistic considering the changed background since the times of the 'era of treaty making' in 1960s and 1970s, when mainly states were the relevant actors. However, also the bottom-up model

faces several challenges, above all ensuring dialogue and coherence between the various instruments and norms, as well as the forums to develop or implement them (International Academy of Astronautics, 2018).

Most importantly, Option 1 proposed in the Secretary-General's policy brief would need to consider that a unified regime on space traffic management would have to find adequate answers to the fundamental differences between civil and military uses of outer space. This difference has been present in the UN bodies, the foreground institutions dealing with outer space activities for many decades, as will be shown in the following.

The UN Bodies Dealing with Outer Space: Challenges by Privatisation and Commercialisation

The United Nations has been at the forefront of developing the rules and legal principles for the peaceful use and exploration of outer space since the beginning of the space age (Kopal, 2011). The Committee on the Peaceful Uses of Outer Space (UNCOPUOS) and its two subcommittees, the Technical and Scientific Subcommittee and the Legal Subcommittee, which meet annually (in New York and, since 1996, in Vienna), supported by the UN Office for Outer Space Affairs (UNOOSA, in Vienna) represent important foreground institutions for the governance of outer space activities.

Reflecting the change of the background of only a few states at the time of the Cold War to a large number of interested states, UNCOPUOS has increased since its creation from 24 to now 102 members. Still, decisions are taken by consensus. This means that the work within UNCOPUOS takes a lot of time and often requires significant compromises. Geopolitical tensions have already disrupted efficient and stringent decision-making (Kendall and Brachet, 2023).

Privatisation and commercialisation have additionally challenged the work of UNCOPUOS (von der Dunk, 2011; Marboe, 2015). Governmental actors and the primary public purpose of space activities that existed in the early years of the space age are no longer predominant as background. In 2022, more than 50% of the launches were procured by commercial companies (McDowell, 2023). In 2021, space infrastructure companies received 14.5 billion USD of private investment (Sheetz, 2022). The new private actors in outer space, in particular in the small satellite industry, include SpaceX and OneWeb (USA), Telesat, Canada), Planet (USA/Germany), Spire, USA/Lux/UK, and O3b/SES, Lux.[9]

This increase in space object launches and the rise of so-called mega-constellations of small satellites, mostly financed by private companies (Euroconsult, 2023), have exacerbated the problem of overpopulation and congestion of outer space and have significantly heightened the risk of collisions. The numbers of objects launched into outer space are regularly published by the UNOOSA and show that, in 2022, more than 2,200 objects were launched; in 2021, approximately 1,800; and in 2020, about 1,200 objects (Our World in Data, 2023). This is an unprecedented increase in relation to previous

years. By way of comparison, the number of objects launched into outer space in 2012 was around 130, similar to, for example, 1992 or 1972, when the numbers were also about 130 per year (Our World in Data, 2023).

To the large number of objects launched into outer space, the number of so-called space debris – i.e. pieces and fragments, rocket stages, or satellites that are no longer in use – must be added (Kypraios and Carpanelli, 2018; Viikari, 2015). These objects also populate Earth's orbit and contribute to the risk of collisions. In early 2023, the number of all objects in orbit catalogued by the US Space Surveillance Network was approximately 27,000 (National Aeronautics and Space Administration Orbital Debris Program Office, 2023). Pieces that are smaller than 10 cm cannot precisely be tracked but are estimated to be around 670,000 for sizes larger than 1 cm, which are still sufficient to disable a spacecraft and penetrate the shields of the International Space Station (ESA, 2023). In view of the very high speed – at approximately 28,000 km per hour – even small pieces can cause catastrophic damage to functioning satellites and other spacecraft.

The trend to launch large numbers of space objects seems to continue. Amazon, Google, SpaceX, and Facebook announced the need for thousands of satellites in the next year (Sheetz and Petrova, 2019; Euroconsult, 2021). The large number of space objects launched is mainly due to the increased reliance on 'small satellites,' up to a mass of 500 kg. They have matured from pure educational projects to systems, which are perceived as means to validate new technology and operational procedures in space at relatively low cost and within timeframes unseen in traditional space missions (Koudelka, 2016). However, the problems of lack of reliability and manoeuverability, which were characteristic of small satellites at the beginning, have not been entirely overcome yet and pose a serious problem for the prevention of collisions in space (ESPI, 2020).

Why do we need so many satellites? Originally, the focus of the use of outer space was on satellites in an orbit of around 36,000 km altitude above Earth's surface, in the so-called Geostationary Earth Orbit (GEO). In this orbit, satellites seem to be stationary from Earth, the antennas receive the signals in a fixed position, and only three powerful satellites are needed to reach almost every place on Earth (International Academy of Astronautics, 2006; Koudelka, 2011). These advantages made the use of satellites in the GEO very successful, as they could provide services, most importantly television broadcasting, all over the world. However, the GEO satellites are far away, need a lot of power, are very expensive, and have the problem of 'latency' – i.e. the duration of the signals from Earth to the satellite and back. This leads to delays, which are increasingly seen as not tolerable. Private and commercial operators want to optimise services for their clients, but also governmental users, including military users, seek to overcome the problem of latency.

In order to do so, satellites need to operate in orbits much closer to Earth, the so-called Low Earth Orbit (LEO), up to an altitude of not more than 2,000 km (International Academy of Astronautics, 2006). In LEO, latency is not a

problem; the satellites can be smaller and much cheaper. The backside of this is that many more satellites than just three are necessary to cover the entire Earth's surface. In addition, the need for more bandwidth, which allows more users at the same time, is a reason for launching so many satellites (Koudelka, 2011). The aim is to achieve global communication via satellites, also in remote and sparsely populated regions.

The problem of the risks of collisions and damage caused by the increasing number of space objects, in particular by those not any more functional, was on the agenda of UNCOPUOS since the early 2000s, interestingly not of its Legal Subcommittee but of its Scientific and Technical Subcommittee, which dealt with it primarily as a technical problem. The UNCOPUOS Space Debris Mitigation Guidelines (UNCOPUOS, 2007) were based on the IADC Space Debris Mitigation Guidelines (IADC, 2002; revised in 2007 and 2021), developed by the Inter-Agency Debris Coordination Committee, an international forum of national and regional space agencies for the worldwide coordination of activities related to the issues of man-made and natural debris in space. According to IADC, 'space debris' is defined as 'man-made objects, including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non-functional' (IADC, 2002). The Space Debris Mitigation Guidelines focus on the protection of two highly valuable Earth orbits – namely, the LEO (up to an altitude of 2,000 km) and the GEO (at an altitude of app. 36,000 km). They concentrate on the following (IADC, 2002; UNCOPUOS, 2007):

1 Limitation of debris released during normal operations
2 Minimisation of the potential for on-orbit break-ups
3 Post-mission disposal
4 Prevention of on-orbit collisions

One mitigation measure is to limit the time of space objects in orbit. According to the Guidelines, space objects should not remain in LEO for more than 25 years after their operational lifetime (IADC, 2002). The revised version of the IADC Guidelines provides that the probability of success of the disposal should be at least 90%, that for specific operations such as large constellations, a shorter residual orbital lifetime, and/or a higher probability of success may be necessary, and that retrieval is also a disposal option (IADC, 2002).

The Guidelines on the mitigation of space debris by IADC and UNCOPUOS focus on technical instructions. They may be regarded as an 'industry standard.' As such, they are not legally binding and can hardly be regarded as 'recommendations' to UN member states because they do not, for example, have the status of General Assembly resolutions. Even less do they create binding norms for private actors, which increasingly develop and launch objects into outer space.

UNCOPUOS, therefore, took the next step with the aim of ensuring the safety of space operations in 2010, when the Scientific and Technical Subcommittee began considering as an agenda item the long-term sustainability of outer space and established a working group (Stubbe, Kopal, and Schrogl, 2015). A result was

reached in 2019 when 21 Guidelines for the Long-Term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space (LTS Guidelines) were adopted (UNCOPUOS, 2019). The Guidelines are complemented by extensive commentaries on how they should be interpreted and applied. They address legal and policy aspects as well as scientific and technical matters of space activities.

The legal value of the LTS Guidelines is rather modest. They were not submitted as a self-standing General Assembly resolution, but only adopted by UNCOPUOS and published as an Annex of its annual Report to the General Assembly (UNCOPUOS, 2019). In addition, their voluntary character is strikingly often repeated (23 times). Nevertheless, they have received a lot of attention and are prominently referred to as reflecting contemporary international consensus on how to use and explore outer space by both governmental and private actors (Artemis Accords, 2020; Deplano, 2021).

The success of the LTS Guidelines will ultimately depend on their application and implementation in practice. It is interesting to note that the LTS Guidelines devote a lot of attention to national legal frameworks and administrative practices as well as to the importance of authorising and supervising space activities of private and commercial actors by UN member states. In so doing, they go into more detail than the General Assembly Resolution on National Space Legislation of 2013 (Marboe, Setsuko, and Brisibe, 2015) but still leave a lot of flexibility to the states concerned.

At the international level, the Guidelines also need to be implemented, and their implementation needs to be monitored. For this purpose, UNCOPUOS is called to serve as the principal forum. This can be seen as a confirmation of the role of this foreground institution despite its challenges in view of the changed background since its creation. In this vein, the report *Our Common Agenda* refers to the LTS Guidelines and accurately notes that they 'have shown that progress in governance is possible, but many gaps remain' (United Nations Secretary-General, 2021).

Military Use of Outer Space: The UN Conference on Disarmament

With respect to the 'security in outer space,' the Secretary-General's policy brief on outer space recommends launching negotiations on a treaty to ensure peace, security, and the prevention of an arms race in outer space, for example, through the relevant disarmament bodies of the United Nations (United Nations Secretary General, 2023).

The Conference on Disarmament (CD) in Geneva, another relevant foreground institution for the governance of outer space in the framework of the United Nations, has discussed initiatives in this context for many years. UN member states have drafted resolutions under the agenda item 'Prevention of an Arms Race in Outer Space' (PAROS) since 1981, and Russia and China submitted draft texts for a treaty in 2008 and 2014 (Tronchetti, 2015). However, due to the opposition of several states, including the United States, these

initiatives have not been successful. Another attempt was the draft 'International Code of Conduct for Outer Space Activities,' initiated by the European Union (Neumann and Schrogl, 2009), which, however, also failed in 2015 (Beard, 2017). The reason for these failures are connected to the background of the increased number of states engaged in outer space activities with, however, disparate military strength and geopolitical interests.

Only recently, in 2020, could agreement be found on a resolution entitled 'Reducing Space Threats through Norms, Rules, and Principles of Responsible Behaviours' (United Nations General Assembly, 2020, 2021). On the basis of this resolution, member states are called to provide inputs on existing and potential threats and security risks to space systems, characterisations of actions, and activities that could be considered responsible, irresponsible, or threatening and their potential impact on international security, and ideas on the further development and implementation of norms, rules, and principles of responsible behaviours and on the reduction of the risks of misunderstanding and miscalculations with respect to outer space. An 'Open-Ended Working Group' was established with first meetings in 2022 and 2023.

It is in this foreground institution, the CD in Geneva, that new instruments to prevent weaponisation of outer space are supposed to be developed. After many years of stagnation, there is a revived dynamic with active participation of a large number of space-faring states, including the United States, China, and the Russian Federation. The Secretary-General's idea on the 'elaboration of new instruments to prevent weaponization of outer space' can be understood as an appreciation of this process and may support it but will rather not need or lead to new institutions or procedures.

Frequency Coordination – The Role of the ITU

The ITU is one of the oldest international organisation. It was founded in 1865 as the International Telegraph Union with the purpose of regulating the use of the telegraph as the long-distance electronic communication instrument at the time (von der Dunk, 2015a). The ITU is still in operation to enable international telecommunication, which is of utmost importance for the operation of satellites. It, therefore, represents another important foreground institution for the governance of outer space, as the UN specialised agency for information and communication technologies.

With a need for frequencies to communicate with and operate objects in outer space activities, the ITU became responsible for the coordination of frequencies and orbital positions used by satellites (Matas, Henri, and Loo, 2016). The main objective of its work is to avoid harmful interferences of satellite operation and communication. The ITU sets out, in its Constitution, that satellite orbits, together with radio frequencies, are 'limited natural resources' which require rational, efficient, and economical use (ITU Constitution and Convention, 1994: Art. 44 ITU Constitution).

Its goals are achieved by the coordination and allocation of frequencies and orbital slots between ITU member states. Every state has an utmost interest in the recognition and protection of its frequencies, which is why the ITU has universal membership, just like the United Nations – namely, 193 states. The ITU originally operated against the background that states are the main actors in telecommunication. However, in view of privatisation and commercialisation, the ITU adapted its way of working. With a change in its Constitution, it made it possible for companies, universities, research institutes, and international and regional organisations to become so-called sector-members (von der Dunk, 2015a). As such, they are represented at the World Radio Conferences (WRC) and can influence the way frequencies and orbital slots will be distributed in the future. While the rights as such are still granted to states, the envisaged users are, to a large extent, private entities and commercial operators. More than 900 sector-members are invited to the WRC to contribute to the process and definition of rules of the coordination of frequencies and orbital slots and responding to new technological developments. The ITU was, therefore, able to react to the change in the respective background situation.

The ITU can serve as an example of how to include private and commercial entities in the development of global norms relevant to outer space activities. Yet, the challenge of the ITU is also the enforcement of its rules, which are not always complied with.

Conclusion

The Secretary-General, in his report, *Our Common Agenda*, addresses the aforementioned problems of the use of outer space directly and explicitly (United Nations Secretary-General, 2021). This is in contrast to the 2030 Agenda for Sustainable Development, in which the term 'outer space' does not appear (United Nations General Assembly, 2015). The report, therefore, reflects the dramatically increased problem of the 'projected degradation of the global commons,' which affects 'the high seas, the atmosphere, Antarctica and outer space,' (United Nations Secretary-General, 2021: 48). His proposed way forward towards a future space governance is a 'combination of binding and non-binding norms building on existing frameworks and drawing in the full range of actors now involved in space exploration and use' (United Nations Secretary-General, 2021), to be discussed at the Summit of the Future.

This proposed way forward is a possibility of integrating the established foreground institutions discussed in this chapter – the five UN treaties on outer space, the UN bodies dealing with outer space, and the ITU – with the new background institutions – the increased number and diversity of space-faring states, as well as the privatisation and commercialisation of outer space activities.

While a stable and reliable legal framework for outer space activities could best be achieved by binding instruments, the role of non-binding instruments must not be underestimated. This has to do with two specificities of the law of

outer space – namely, the concepts of 'responsibility' and 'liability' of states, as they feature in the UN treaties on outer space, in particular in the Outer Space Treaty and the Liability Convention.

The 'responsibility' of states is established under Article VI of the Outer Space Treaty for their national activities in outer space, whether they are carried out by governmental agencies or non-governmental entities – i.e. by private companies. Article VII of the Outer Space Treaty and Articles II and III of the Liability Convention establish the 'liability' of the launching state for damage caused by its space objects. These two characteristics can help to address the challenges of the future, including those connected to the privatisation of space activities.

With respect to 'responsibility' under international space law, the state has a continuing role in ensuring that its national space activities are carried out in conformity with the obligations of international space law, including the prohibition of appropriation, the obligation of due regard, and the prohibition of environmental degradation (von der Dunk, 2011). The state will also want to ensure that private actors carry out space activities in accordance with its political and security interests (Gerhard, 2009). The best way of doing so is via national space legislation (Marboe, 2015). It follows that by way of national space legislation, non-binding norms or vague provisions contained in treaties can be transformed into concrete legal obligations of the respective private space actors. This represents an excellent example of a 'combination of binding and non-binding norms', which cannot be overestimated.

Concerning 'liability,' international space law establishes the liability of the launching state without distinction between space objects launched by governmental or private entities (Kerrest and Smith, 2009). Furthermore, according to the Liability Convention, the launching state is absolutely liable for damage caused on Earth and aircraft in flight. This liability is unlimited (Smith, Kerrest and Tronchetti, 2013). If damage is caused by collisions in outer space, the launching state is liable if the damage is due to its fault or the fault of persons for whom it is responsible. The criterion of 'fault' is not defined in the Liability Convention and needs to be interpreted by use of the rules of treaty interpretation contained in the Vienna Convention on the Law of Treaties (Smith, Kerrest and Tronchetti, 2013). These rules refer to the ordinary meaning of a term, its context, the object and purpose of the treaty, and subsequent practice or agreement (VCLT, 1980). Accordingly, 'fault' can be understood as 'negligent' behaviour – i.e. a behaviour that is not in conformity with a standard of care which could be expected from a reasonable person (Smith, Kerrest and Tronchetti, 2013). In the context of space activities, the standard of care must be that of a responsible person carrying out space activities. This means that the activity must be carried out in conformity with the contemporary state of the art in outer space technology. Here, 'industry standards' and other technical standards and guidelines come into play. It is possible that a violation of soft law rules, technical standards, and standards of behaviour becomes a relevant factor in the determination of 'fault' (Marboe, 2012; Stubbe, Kopal, and Schrogl, 2015). Such violation can be regarded as a lack of care, lack of

diligence and due regard, as expected in the circumstances. From this follows a compelling incentive for states and private operators to follow 'soft law' standards, namely to avoid liability for damage.

It can, therefore, be concluded that a 'combination of binding and non-binding norms, building on existing frameworks and drawing in the full range of actors now involved in space exploration and use,' as stated in the Secretary-General's plans for the Summit of the Future, will be the right way for the future governance of outer space and for its preservation as a global commons. The most important challenges in this context are not the norms – binding or non-binding – but the ways and means of their implementation and enforcement. To achieve this goal, a 'multi-stakeholder dialogue on outer space' will most likely not be sufficient. Yet, it can help to raise awareness of the importance of monitoring compliance. It shall not be overlooked that there are already ways of monitoring and enforcement at the national and international levels, which are currently underutilised.

Notes

1 The Rescue and Return Agreement has 99 ratifications, the Liability Convention 98, and the Registration Convention 74, as of March 2023. The Moon Agreement has only 18 ratifications (UNOOSA, 2023).
2 United Nations General Assembly, The Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting, Resolution 37/92 of 10 December 1982.
3 United Nations General Assembly, Principles Relating to Remote Sensing of the Earth from Outer Space, Resolution 41/65 of 3 December 1986.
4 United Nations General Assembly, Principles Relevant to the Use of Nuclear Power Sources in Outer Space, Resolution 47/68 of 14 December 1992.
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