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Widening the horizons of outer space law

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The central research question of this study asked whether the existing international legal framework for space activities adequately regulates the current and future challenges and opportunities of the use, exploration and exploitation of outer space, and if not, how this can be remedied. The sub-questions specifically analysed current and future challenges, future opportunities, and the Netherlands' legal framework as a case study.

Reading through the preceding chapters, one could bluntly reply 'no' to those questions; it has become clear that, although a basic legal framework is in place, it cannot address all current and future challenges and opportunities. However, as legal scholars usually do, this short answer would have to be supplemented with the traditional 'but', to read 'no, but'. Indeed, the legal framework that was carefully built during the first sixty years of space exploration is of immense value and must be preserved. *But* it is not sufficiently robust to address all the new questions that are arising because of the rapid pace at which technology advances and of the increase and variety of actors in this field. It is simply not sufficient to govern the continued and expanding use and exploration of outer space in a sustainable, safe and secure manner.

For that reason, both with respect to current and future challenges as well as to embrace future opportunities that the use and exploration of outer space can bring, and to further enhance the efficient and future-proof national implementation of international law, it is necessary to *clarify and supplement* the existing legal framework, in other words, to *widen the horizons of outer space law*. The next sections address (1) what needs to be clarified, (2) what supplements are needed, (3) how clarifying and supplementing space law could be accomplished, (4) what role national law can play in this context, and (5) ends with some final thoughts on the future of space law.

1 CLARIFYING SPACE LAW

Certain concepts must be clarified to provide legal certainty, such as the exact definition of *space object*, which leaves open the question whether an inactive object such as debris qualifies as such and is subject to the legal consequences of that qualification. Objects that are no longer functional should still fall under the definition of space object, because otherwise they would have an unidentified legal status. The contrary would mean that there would be no liability for the compensation of damages under the 1972

Liability Convention, which stipulates that damage must be ‘caused by a space object’.¹ If there is no risk of being held liable for damage caused by a non-functional object, there would be no incentive for States to remove these objects by deorbiting them and requiring private operators under their jurisdiction to do so as part of the licensing conditions. The definition of space object that is contained in the UN space treaties does not exclude such a broad interpretation, as it defines space objects as ‘including component parts as well as the launch vehicle and parts thereof’ and says nothing about the active or inactive status of space objects.²

Likewise, it is necessary to clarify the meaning of *fault* in case of damage occurring in outer space.³ States as well as insurers and private entities ought to know what constitutes fault, and how they can mitigate or avoid it. Not de-orbiting an object after its useful life could be considered an element of fault, just as de-orbiting it could be seen as a factor mitigating fault. Jurisprudence on this matter would greatly help in clarifying the concept of fault, but it is not likely that a case will be brought before an international court or tribunal in the near future, as States seem to prefer to solve their disputes via other means. Indeed, there has never been an international adjudication involving a dispute between States, neither in the International Court of Justice, nor via the specially developed optional rules for arbitration of disputes relating to outer space related of the Permanent Court of Arbitration.⁴

The concept and scope of *ownership, jurisdiction and control* also need clarification.⁵ This is specifically relevant in the context of new industries like active debris removal and on-orbit servicing and the large number of objects in Low Earth Orbit (LEO). If ownership, jurisdiction and control are ‘eternal’, as the space treaties suggest, objects cannot be abandoned at the end of their useful life and the debris removal industry would need to make sure they have the proper authorizations in place before they proceed with their activity. Contrary to, for instance, the shipping industry, it seems that the specific characteristics of the outer space environment, such as its remoteness, the absence of sovereignty and the complexities of low gravity,

1 Art. II and III of the Convention on International Liability for Damage Caused by Space Objects, adopted 29 Nov. 1971, entered into force 1 Sept. 1972 (hereafter Liability Convention).

2 Art. I(d) of the Liability Convention and art. I(b) of the Convention on Registration of Objects Launched into Outer Space, adopted 12 Nov. 1974, entered into force 15 Sept. 1976, 1023 UNTS 15 (hereafter Registration Convention).

3 Art. III of the Liability Convention.

4 See <https://docs.pca-cpa.org/2016/01/Permanent-Court-of-Arbitration-Optional-Rules-for-Arbitration-of-Disputes-Relating-to-Outter-Space-Activities.pdf>. The author was appointed by the Netherlands as arbitrator, see <https://pca-cpa.org/en/about/panels/panels-of-arbitrators-and-experts-for-space-related-disputes/> (both accessed in November 2022).

5 Art. VIII of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, adopted 19 Dec. 1966, entered into force 10 Oct. 1967, 610 UNTS 205 (hereafter Outer Space Treaty).

are best served by such eternal ownership, jurisdiction and control which provide stability, while industry should find other means to secure its business model.

The principle of *due regard* and the meaning of *harmful interference* are further examples of concepts that require clarification.⁶ The meaning of due regard can be inferred from public international law discourse on this topic. It likely implies a certain standard of care and entails 'a duty to cooperate, to strike the most appropriate balance between the divergent rights or obligations at stake.'⁷ Harmful interference with the activities of other States is not *per se* prohibited, but if there is a chance that it may occur, States are required to undertake appropriate international consultations. Although harmful interference certainly has occurred, as illustrated by the issues caused by large constellations to astronomical observations that were addressed in chapter VI, it seems that so far, no request for international consultations has been issued.⁸ Having a clear set of 'rules of the road' in the form of a Space Traffic Management (STM) regime, guidelines for decommissioning of satellites at the end of their useful life and increased tracking capability would go a long way in avoiding harmful interference, but this is currently not available.

These are just a few examples of *current* challenges posed by debris mitigation and the long-term sustainability of space activities, and of *mid- to longer term* challenges such as those posed by large constellations and the potential incompatibility between several legitimate uses of outer space. The legal framework for space activities needs to be equipped with additional tools to address these challenges.

2 SUPPLEMENTING SPACE LAW

In terms of the need to *supplement* the current framework, any innovative use of outer space will bring new legal questions. For instance, *space resource utilisation* requires an answer about the legality of owning space resources in the context of the non-appropriation principle.⁹ If ownership of space

6 Art. IX of the Outer Space Treaty.

7 Mathias Forteau, 'The Legal Nature and Content of "Due Regard" Obligations in Recent International Case Law', 34 *The International Journal of Marine and Coastal Law* 1 (2019), p. 25-42. In the context of space law, see Michael Mineiro, 'Article IX's Principle of Due Regard and International Consultations: An Assessment in Light of the European Draft Space Code of Conduct', *Proceedings of the International Institute of Space Law 2010* (Eleven Publishing, 2011), p. 674-686.

8 Interestingly, in 2021 China used art. V of the Outer Space Treaty to notify the UN about preventive collision avoidance between the China Space Station and 2 Starlink satellites, rather than requesting the US to enter into consultations via art. IX. *Note verbale dated 3 December 2021 from the Permanent Mission of China to the United Nations (Vienna) addressed to the Secretary-General, A/AC.105/1262*.

9 Art. II of the Outer Space Treaty.

resources were to be interpreted as illegal, then the adoption by consensus of the Moon Agreement in 1979 would make no sense, because this treaty addresses exactly that: the use of space resources.¹⁰ At the time of writing, four States have national legislation addressing this question (viz., the USA, Luxembourg, the United Arab Emirates and Japan), but that is not an ideal solution and may result in fragmentation. A way must be found to confirm whether the global community of States agrees that ownership of resources is not prohibited, and interpretation of a treaty should be carried out by its States Parties in accordance with the rules of treaty interpretation contained in the 1969 Vienna Convention on the Law of Treaties.¹¹ Of course, admitting that owning space resources is not illegal does not mean that there are no conditions or limitations to such ownership. The development of those conditions and limitations is the law-making challenge we are faced with. An example is the creation of 'safety zones' around mining operations on celestial bodies, which may be necessary to ensure safety and could be seen as a way of exercising 'due regard', as suggested in NASA's Artemis Accords.¹² But rules will be needed about their size, duration and scope, as well as their registration and recognition by other stakeholders, otherwise such zones would be worthless in an international context. A parallel can be made here with the regulation of the Geostationary Satellite Orbit (GSO), where slots and frequencies are allocated to users following a strict process of notification, coordination, publication and registration in the master international frequency register. The system only works if it is managed by an independent global authority, such as in this case the International Telecommunication Union.¹³

Another example is the duty to ensure that exploration and use of space resources are carried out 'for the benefit and in the interests of all countries.'¹⁴ This is perhaps the most demanding and complex challenge to solve.¹⁵ The Hague International Space Resources Governance Working Group included the topic in its Building Blocks, proposing that 'the international framework should provide that States and international organizations responsible for space resource activities shall provide for benefit-sharing through the promotion of the participation in space resource activities by

10 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, adopted 5 Dec. 1979, entered into force 11 July 1984, 1363 UNTS 3 (hereafter Moon Agreement).

11 See arts. 31 and 32 of the Vienna Convention on the Law of Treaties (adopted 23 May 1969, entered into force 27 Jan. 1980), 1155 UNTS 331.

12 *Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids for Peaceful Purposes* (Artemis Accords), sec. 11, available at <https://www.nasa.gov/specials/artemis-accords/img/Artemis-Accords-signed-13Oct2020.pdf> (accessed in November 2022).

13 See Tanja Masson-Zwaan and Mahulena Hofmann, *Introduction to Space Law* (2019) at p. 142-144.

14 Art. I of the Outer Space Treaty.

15 See on this matter Michael Simpson, 'Benefit in Space Law: Principle and Pathway', 45 *Air & Space Law* (2020), p. 143-156.

all countries, in particular developing countries.’¹⁶ The Building Block lists the following examples of benefits, and, interestingly, the Working Group considered that compulsory monetary benefit sharing should not be required:

‘enabling, facilitating, promoting, and fostering: a) The development of space science and technology and of its applications; b) The development of relevant and appropriate capabilities in interested States; c) Cooperation and contribution in education and training; d) Access to and exchange of information; e) Incentivization of joint ventures; f) The exchange of expertise and technology among States on a mutually acceptable basis; g) The establishment of an international fund.’¹⁷

There are also more practical issues related to space resource utilisation that need a legal answer. An object made solely from lunar material without being launched into Earth orbit or beyond, perhaps best qualified as a ‘space-made object’¹⁸, does not seem to fall under the definition of ‘space object’ in the context of the 1974 Registration Convention, which extends the obligation to register only to objects ‘launched into Earth orbit or beyond’.¹⁹ Following that reasoning, bricks made of lunar regolith for the construction of a lunar base,²⁰ or rocket propulsion fabricated from lunar ice²¹ would not need to be registered with the UN or in a national registry because they have not been launched into Earth orbit or beyond. One might argue that the bricks are a ‘component part’ of the 3-D printer that made them and that was launched from Earth, but this reasoning may be a bit far-fetched. It also does not seem pragmatic to register space-made bricks in the UN registry or a national registry. It seems even less realistic to register rocket fuel made from lunar ice. But it may be desirable to find other means to identify and

16 The Hague International Space Resources Governance Working Group, *Building Blocks for the Development of an International Framework on Space Resource Activities*, November 2019, Building Block nr. 13 (‘Sharing of benefits arising out of the utilization of space resources’), see <https://www.universiteitleiden.nl/en/law/institute-of-public-law/institute-of-air-space-law/the-hague-space-resources-governance-working-group> (accessed in November 2022).

17 *Ibid.*

18 This term was coined by the Hague International Space Resources Governance Working Group in its Building Block 2.5: ‘Space-made product: a product made in outer space wholly or partially from space resources’, adding, in a footnote: ‘According to the understanding of the Working Group, this excludes raw mineral and volatile materials, including water, irrespective of form’, *ibid.*

19 Art. II of the Registration Convention.

20 Lunar regolith is the dust, soil and rock on the Moon’s surface, see, e.g., ESA, *Powering the future with lunar soil* (2019), https://www.esa.int/Enabling_Support/Preparing_for_the_Future/Discovery_and_Preparation/Powering_the_future_with_lunar_soil (accessed in November 2022).

21 See, for instance, NASA, *CubeSat to Demonstrate Water-Fueled Moves in Space* (2021), <https://www.nasa.gov/feature/ames/ptd-1>. The US company Orbit Fab is planning to build gas stations in space, see <https://www.orbitfab.com/> (both accessed in November 2022).

record such ‘space-made’ objects, to ensure transparency. Whether liability for the compensation of damage under the 1972 Liability Convention could attach to such objects may be less questionable at first sight, since for liability to attach to an object there is no requirement of it being launched into Earth orbit or beyond. However, a launching State would still need to be identified, and usually the State of registry is the launching State that is easiest to identify since only a launching State may register a space object.²² It is doubtful that a lunar brick or rocket fuel made from lunar ice have a launching State at all and therefore it may be difficult to identify a liable State in case of damage occurring because of space-made objects. Clearly, additional rules regarding registration and liability for space-made products will be necessary.

Private human spaceflight and suborbital flights may bring the question of the definition and delimitation back to the table and may require the adoption of a special regime borrowing from two areas of law that so far were separate. The fact is that such flights are already happening, and although they are initially taking place within the jurisdiction of one State, the USA, which has developed a regulatory framework that suffices for the time being, flights will at some point be crossing national borders, requiring an international legal regime. More States are starting to facilitate such flights and are drafting legislation, and some harmonisation of national regimes is desirable to ensure clarity and transparency. The legal status of, and the chain of command among the persons on board must be clarified, as well as applicable liability regimes, insurance obligations, security provisions and more. Earlier efforts by ICAO and UNOOSA to find solutions that satisfy concerns about safety as discussed in chapter X have so far not garnered tangible results, and more work is needed not only on the substantive law but also to determine which body will be charged with oversight and implementation of the regime.

Complementing the current framework is also needed to solve the challenges of *increased use* of outer space and to satisfy the growing call for long-term sustainability of space activities. For instance, with regard to large constellations, a trend can be observed towards stricter requirements on end-of-life decommissioning and an increased need for tracking mechanisms and improved space situational awareness.²³ The developments in the field of STM in various regions in the world form another example.²⁴

22 Art. II of the Registration Convention.

23 A good example is the 5-year rule to de-orbit satellites at the end of their life, adopted by the US Federal Communications Commission in September 2022 to replace the decades-old 25-year rule. See <https://www.fcc.gov/document/fcc-adopts-new-5-year-rule-deorbiting-satellites> (accessed in November 2022).

24 For instance, US Space Policy Directive-3, *National Space Traffic Management Policy* of June 2018 and the ambition of the EU expressed in the *Joint Communication to the European Parliament and the Council, An EU Approach for Space Traffic Management*, JOIN (2022) 4 final, European Commission and High Representative of the Union for Foreign Affairs and Security Policy, 15 February 2022 (hereinafter referred to as Joint Communication).

Likewise, practical matters such as the process of registering satellites launched into outer space must be improved to remain manageable, possibly by means of automation or artificial intelligence.

The needs for additional space law related to the use of space resources, private human spaceflight and to meet the challenge of sustainability demonstrate how *new, innovative and increased uses* of outer space necessitate additional rules to solve issues that were not envisaged in the 1960s and 1970s.

3 WAYS AND MEANS

An important question is *how* the clarifications and supplements of space law that were described above should be implemented. There are several ways which can, or perhaps should, be applied simultaneously. In my view, one method should be avoided, and that is the amendment of the current UN space treaties. Opening these up for even a minor amendment runs the risk of opening a Pandora's box and would lead to the loss of a system that has worked well and can continue to work. The large number of States that need to reach consensus²⁵ and the great divisions that characterise the current geopolitical landscape require great caution. It is a good sign that no State has ever suggested an amendment to, and no State has ever withdrawn from any of the UN space treaties.

Looking at what other means would work, it seems clear that the adoption of new space treaties is unlikely in the near term. Therefore, the best method to solve these challenges lies in the adoption of 'soft law' in the form of UN resolutions, sets of guidelines or industry best practices. However, to be a realistic and successful alternative to 'hard law', the quality and efficiency of these secondary international law sources, as well as States' willingness to apply and enforce them, must be ensured. Soft law will only be useful if it can stand up to the test of being applied and enforced and if it can overcome the barriers of politics, deadlocks and other forms of stagnation like those experienced in the Conference on Disarmament. To be able to meet the challenge and to remain relevant in the future as a global forum for space-law making, UNCOPUOS should find a way to take social, cultural and commercial interests and views of non-State stakeholders into account. The working groups established by the two Subcommittees where non-State stakeholders can be heard is a step in the right direction, but they remain under the umbrella of the COPUOS Member States. The formula which the International Telecommunication Union (ITU) adopted with the introduction of over 900 non-voting Sector Members, Associates, and

25 At the time of writing, UNCOPUOS has 100 member states, see <https://www.unoosa.org/oosa/en/members/index.html> (accessed in November 2022).

Academia in addition to the 193 Member States is excellent.²⁶ This group includes companies of all sizes, active in different sectors of the economy, and universities from all over the world. This distinctive feature of the ITU merits further research, to see if such multistakeholder processes could be applied in other UN bodies like COPUOS as well.

Considering more specifically the issues identified among *current and future challenges*, the clarification of treaty terms needs to be effectuated by States Parties to the treaties. This clarification could be realised by means of official statements in UNCOPUOS, consistent State practice, and other means. States could for instance include in their official statements an expression about their understanding of the concept of space object, the meaning of fault or due regard, and what constitutes harmful interference. If enough States make such statements in a harmonious way, the interpretation may gain traction and eventually become generally accepted among the parties. In any case, only interpretation by the States Parties to a treaty has legal significance, but State practice and inclusion into national law can also help reach a global understanding. It seems that most of the clarifications identified above should be relatively non-contentious and should be realisable. Having confirmation that space debris is still a space object, that fault can be constituted or alleviated by certain actions such as de-orbiting at end-of-life, and that ownership cannot be abandoned so that permission must be obtained before an object can be removed from orbit will greatly contribute to legal certainty and clarity. Another means by which these clarifications can be achieved is by adjudication by an international judicial body such as the International Court of Justice. However, it does not seem likely that this will happen unless an extreme case of damage occurs, such as loss of life.

To facilitate and encourage the active debris removal industry, it is advisable to first focus on removing debris of actors within the same jurisdiction. As the industry matures, contracting can be a good way to ensure the company acts in compliance with the space law principles, such as ownership, jurisdiction and control. Contracts that clarify liability and insurance issues will help in reducing uncertainty.

Regarding large constellations, States must be encouraged to use the tool offered by article IX of the 1967 Outer Space Treaty and request international consultations when harmful interference with their own space activities, such as astronomy, occurs. Although it could be argued that asking for such consultations could be contentious, and create tension, they can be a politically harmless means to clarify matters in a diplomatic setting and help create awareness about the interests of different stakeholders.

States should also be reminded of their responsibility under article VI of the 1967 Outer Space Treaty, requiring their authorisation and supervision of the activities performed by their nationals. Possibly, stricter audits and

26 See <https://www.itu.int/hub/membership/our-members/> (accessed in November 2022).

stakeholder consultations should form part of that process, and environmental impact assessments could be carried out. UNCOPUOS or bodies like the International Law Association could assist this process of a more robust authorisation and supervision process by proposing further guidelines for the implementation of article VI in the form of model national space legislation.

Looking at the issues raised by *future opportunities* such as *space resource utilisation*, the adoption of even more national laws confirming that private entities may own space resources is not desirable. The laws adopted by especially the USA, and to a lesser extent those adopted by Luxembourg, Japan and the UAE, were perhaps necessary to convince the international community that this topic requires its attention, but now it is time to ensure a global, equitable regime governing the use of space resources. Every effort should be made to facilitate the work of the COPUOS space resources working group, and the chairs of that working group should make efficient use of the considerable work done by various multistakeholder groups in the past five years, such as the Hague Building Blocks. The first impressions of their work allow for some optimism. At the same time, efforts should also continue to encourage States to join the 1979 Moon Agreement, while multilateral non-legally binding political agreements such as the Artemis Accords can also contribute to building consensus towards international agreement.²⁷ It should be encouraged that alternative 'coalitions of the willing', such as the Sino-Russian collaboration towards an International Lunar Research Station do the same; this may help to eventually foster global agreement in fora like COPUOS in a constructive manner. Questions arising from space-made products, including registration and liability, as well as practical implementation, registration and recognition of safety zones and the realisation of an equitable sharing of benefits require international answers to ensure transparency and mutual recognition.

For *human spaceflight*, it is anticipated that eventually a *sui generis* regime will emerge to govern suborbital flights as they fit neither in air law nor in space law, but that for the time being national law suffices. A solution to the issue of the definition and delimitation of outer space is not to be expected anytime soon since consensus is unlikely because several major space actors do not see a need for it, and it is therefore preferable to focus on other solutions such as a *sui generis* regime. The legal status of persons on board spacecraft, whether orbital or suborbital, will also gradually be solved, learning from precedents such as the Crew Code of Conduct for the ISS which for the first time creates a chain of command among persons on board a spacecraft.²⁸ Liability issues will likely initially be solved via contract.

Questions related to *safety and security* ideally require international regulation, even if only by means of soft law, but due to the dual-use and national security aspects of these issues it cannot be excluded that national and regional initiatives will continue to prevail for the time being. The

27 *Supra* n 12.

28 Available at 14 CFR § 1214.403 (USA).

importance of international coordination in these fields must be stressed wherever possible. For *long-term sustainability* of space activities, the situation is slightly different, possibly because the topic is less sensitive. Ten years of hard work in COPUOS have resulted in detailed guidelines that States are requested to implement at the national level and then report the results to COPUOS. This request could be seen as ‘top-down-up’ approach ensuring transparency and possibly even harmonisation, that may be an interesting example to follow. In parallel, industry initiatives such as the Net Zero Space Declaration²⁹ and the Space Sustainability Rating³⁰ are to be welcomed. Another good example of ‘bottom up’ initiatives is the report issued by the World Economic Forum and McKinsey in May 2022, titled ‘The role of space in driving sustainability, security, and development on Earth’, suggesting five actions leaders can take to contribute to economic development, advance global security and sustainability, and make space a safe and globally accessible domain.³¹ Of those five actions, the first immediately recognises the importance of governance and regulation (‘create and implement effective space governance’).³² These initiatives demonstrate the global awareness of the need for action at the level of all stakeholders, whether States or private entities, and that means there here as well, there is reason for hope.

4 THE ROLE OF NATIONAL LEGISLATION

In addition to the further development of space law through soft law adopted at international level, to some extent, where appropriate and feasible, space law can also be further clarified and supplemented through the adoption of national law. National law is especially relevant for States to implement their obligation of authorisation and supervision under article VI

29 The *Net Zero Space Declaration* was launched at the 2021 Paris Peace Forum in a session moderated by the author. The International Institute of Air and Space Law at Leiden University is one of the early subscribers, committing to educate young space lawyers about the legal implications of debris and ways to mitigate and remediate it. See <https://parispeaceforum.org/en/initiatives/net-zero-space/> and <https://www.universiteit-leiden.nl/en/news/2021/11/iiasl-aanwezig-bij-lancering-duurzaamheidsinitiatief-net-zero-space> (accessed in November 2022).

30 *Space Sustainability Rating* (SSR), <https://spacesustainabilityrating.org/>. The author is a member of the SSR advisory group. The first rating was issued in June 2022, see <https://spacesustainabilityrating.org/space-sustainability-rating-now-live/> (both accessed in November 2022),

31 Available at <https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/the-role-of-space-in-driving-sustainability-security-and-development-on-earth>, (accessed in November 2022). The author was a member of the Advisory Board of this project.

32 The other four recommended actions are: invest resources and effort in enabling technologies and capabilities; incentivize collaboration among nations, sectors, and industries; foster a self-sustaining industrial base; and leverage the space sector more to advance sustainability and security.

of the 1967 Outer Space Treaty. Examples of questions for which national regulation is suitable include the licensing conditions for private commercial space activities, such as insurance obligations, the right of recourse of the State in case it is held liable for damage, or the information that must be provided for the registration of space objects. In addition, once international agreement has been reached on the questions of safety, sustainability, or equitable sharing of benefits, the details of such agreement will have to be transposed into national law, to ensure that private entities comply with them as well.

Although the role of the national legislator is becoming more relevant as private entities are more active, less than one quarter on the UN members, i.e., around forty States, have adopted national space legislation.³³ Efforts to increase this number are undertaken by the UN in its capacity-building activities such as the UN conferences on space law and policy and the UN workshops on space law.³⁴ In 2020 the UN launched the 'Legal Advisory Project on Space Law for New Space Actors', and with the help of several donor countries and organisations, technical advisory missions have been carried out for countries in Africa and the Asia-Pacific.³⁵

Besides encouraging more States to adopt national legislation to implement their authorisation and supervision obligations, it is important to emphasise that thought must be given to the implementation of the national law, for instance by delegating authority to a special agency or by engaging external experts. Furthermore, States must be reminded that it will be necessary to regularly test the robustness of the law against new developments, such as the adoption of the 2019 COPUOS long-term sustainability guidelines. In other words, the adoption of a national law is never the end goal; it is a continuous process of testing and adapting where needed.

The UN efforts mentioned above, along with the 2013 UN resolution on national space legislation³⁶ and the model national space law of the International Law Association,³⁷ should go a long way in ensuring harmonisation of national laws. Strict harmonisation is not necessary but aspects such as safety need to be coordinated at the global level. Regional organisations

33 See *National Space Law*, UNOOSA, <https://www.unoosa.org/oosa/en/ourwork/spacelaw/nationalspacelaw/index.html> (accessed in November 2022)

34 See <https://www.unoosa.org/oosa/en/ourwork/spacelaw/conferences.html> and <https://www.unoosa.org/oosa/en/ourwork/spacelaw/workshops/index.html> respectively (both accessed in November 2022)

35 See <https://www.unoosa.org/oosa/en/ourwork/spacelaw/capacitybuilding/advisory-services/index.html>. The 2017 *Handbook for New Space Actors*, published by Secure World Foundation and translated in Spanish (2020) and Chinese (2021) should also be mentioned here, see <https://swfound.org/handbook/> (both accessed in November 2022).

36 A/RES/68/74, *Recommendations on national legislation relevant to the peaceful exploration and use of outer space* (December 2013).

37 International Law Association (ILA), *Sofia Guidelines for a Model Law on National Space Legislation* (2012), available at https://www.ila-hq.org/en_GB/documents/52nd-copuos-lsc-2013-sofia-guidelines-for-a-model-law (accessed in November 2022).

such as the EU can also play a role in this context by encouraging their members to accede to the UN space treaties, but for such a call to action by the EU to be credible, it will first need to make its own declarations of acceptance of the treaties, which seems to be in the plans.³⁸ Coordination among similar-sized and like-minded space-faring countries is also a useful and practical way to not only learn from each other's models, but also to promote harmonisation. A good example is the informal Nordic Space Authority Network Group, where Denmark, Finland, The Netherlands, Norway and Sweden meet annually to discuss and exchange views on matters of common interest.

With all these mechanisms in place and being planned, it seems that national space legislation can constitute a useful additional means to further clarify and complement space law. This is to be seen as a pragmatic solution to some of the issues identified in this study, especially those related to the role and activities of private commercial entities, which fall under the jurisdiction of States. The example of The Netherlands elaborated in part C of this study has demonstrated that national law can be a powerful tool for ensuring compliance of private actors with international space law, as long as it is efficiently implemented and regularly reviewed and updated when necessary.

Despite this generally positive outlook for national space law, it must be reiterated that certain challenges, such as long-term sustainability, safety and the equitable sharing of benefits, require international regulation, even if only through soft law, as they regard humanity as a whole and global compliance with a uniform set of rules is a prerequisite for the peaceful exploration and use of outer space for the benefit of all countries and humankind. It is therefore of utmost importance to continue to strive for global agreement on these issues in fora like UNCOPUOS. And once international agreement is reached on those global questions, the agreed rules should be transposed into national law to bind private entities.

5 FINAL THOUGHTS

This study ends with a final thought about some concerning developments that are taking place since 2007, which are affecting the use and exploration of space and may have an impact on the way forward for progressive space law development described above. Four States have conducted anti-satellite (ASAT) weapon tests in outer space between 2007 and 2021, which have not only resulted in vast amounts of space debris but also created

38 Joint Communication, *supra* n. 24 at para 6.1, p.13. The European Parliament expressed its support for this plan, see *European Parliament resolution of 6 October 2022 on an EU approach for space traffic management - an EU contribution addressing a global challenge*, (2022/2641(RSP)) at F.15.

geopolitical tensions.³⁹ Likewise, the deployment of ‘inspector satellites’⁴⁰ and the increase in cyberattacks against space infrastructure by means of ‘jamming’ or ‘spoofing’ are concerning.⁴¹ The illegal Russian invasion of Ukraine in February 2022 has caused an unprecedented backlash on international space cooperation, even putting the continued peaceful cooperation on the International Space Station (ISS) at risk.⁴² Eight months into the war, it appears that space cooperation, which always seemed immune from geopolitical issues, indeed suffered to some extent from the war, but is once again proving more robust than expected and in September 2022 Russia even expressed that it is likely to continue its participation in ISS until 2028.⁴³ Likewise, the creation by the UN of the Open-ended Working Group on Reducing Space Threats through Norms, Rules and Principles of Responsible Behaviours in 2021,⁴⁴ and unilateral declarations to stop ASAT tests by several States⁴⁵ give reason for hope for continued peaceful cooperation in space for the betterment of all humankind. But this cannot result from passive behaviour. As Schrijver put it in his valedictory lecture at Leiden University, the concept of peace has two sides, ‘positive peace’ and ‘negative peace’:

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- 39 China, the USA, India and Russia. Especially the deliberate destructions by China and Russia of their own satellites, in 2007 and 2021 respectively, created huge amounts of long-lasting space debris. See the useful infographic published by Secure World Foundation (2022), <https://swfound.org/news/all-news/2022/06/swf-releases-new-infographic-on-anti-satellite-weapons-and-space-sustainability/> (accessed in November 2022).
- 40 See, e.g., Brett Tingley, ‘Pentagon space chief condemns ‘irresponsible’ launch of Russian inspector satellite’, *Space.com* (11 August 2022), <https://www.space.com/russia-inspector-satellite-kosmos-2558-irresponsible-behavior> (accessed in November 2022).
- 41 See for an explanation on jamming and spoofing satellite signals, Maya Posch, ‘Knowing your place: the implications of GPS spoofing and jamming’, *Hackaday* (23 May 2022), <https://hackaday.com/2022/05/23/knowing-your-place-the-implications-of-gps-spoofing-and-jamming/> (accessed in November 2022).
- 42 See for an overview, Florin Zubaġcu, ‘Ukraine war disrupting East-West cooperation in space’, *Science Business* (8 March 2022), <https://sciencebusiness.net/news/ukraine-war-disrupting-east-west-cooperation-space> (accessed in November 2022).
- 43 See <https://www.reuters.com/business/aerospace-defense/russia-is-likely-take-part-international-space-station-until-2028-ria-2022-09-21/> (accessed in November 2022).
- 44 See UN General Assembly resolution A/res/76/231 (24 Dec. 2021). See also <https://meetings.unoda.org/meeting/oewg-space-2022/> (accessed in November 2022).
- 45 On 8 April 2022, US Vice President Kamala Harris announced that ‘the United States commits not to conduct destructive, direct-ascent anti-satellite (ASAT) missile testing’, <https://www.whitehouse.gov/briefing-room/statements-releases/2022/04/18/fact-sheet-vice-president-harris-advances-national-security-norms-in-space/>. Canada and New Zealand followed suit in May and July 2022, respectively, see <https://spacenews.com/canada-joins-u-s-in-asat-testing-ban/> and <https://spacenews.com/new-zealand-joins-asat-testing-ban/>, whereas Germany and Japan joined in September 2022, see <https://spacenews.com/japan-germany-declare-moratorium-on-anti-satellite-missile-tests/> (all accessed in November 2022).

'In traditional international law, peace is foremost the absence of war or the threat of war. This is the so-called 'negative peace', which also includes the avoidance of war [...]
[T]he world community should also aim to achieve positive peace, that is the promotion of justice in the world.'⁴⁶

We owe it to the younger generations whose future lies in the sustainable expansion of humanity's footprint into the vast unknown to take up this task. We must continue to work towards 'positive peace' in space cooperation and to clarify, supplement and thus *widen the horizons* of outer space law.

46 Nico Schrijver, *Re-uniting for peace through international law*, Valedictory lecture, Leiden University (1 July 2022), p. 5, citing J. Galtung (n. 10).