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Long-term sustainability of outer space activities

Information and views for consideration by the Working Group on the Long-term Sustainability of Outer Space Activities

Note by the Secretariat

Addendum

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* [A/AC.105/C.1/L.405](#).



II. Replies received from States and organizations

Australia

[Original: English]
[10 November 2022]

Australia: input to the Working Group on the Long-term Sustainability of Outer Space Activities¹

Australia is committed to the development and implementation of rules and norms that seek to support the safety, stability and sustainability of outer space. The Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space provide an effective framework to support this outcome.

This submission provides case studies for consideration by the second Working Group on the Long-term Sustainability of Outer Space Activities. Australian case studies are structured using the reporting approach of the United Kingdom of Great Britain and Northern Ireland for voluntary implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities (A/AC.105/C.1/2020/CRP.15 and A/AC.105/C.1/2021/CRP.16). Additional case studies will be submitted in line with the five-year workplan of the second Working Group on the Long-term Sustainability of Outer Space Activities.

The Australian Space Agency is working with industry to understand their awareness, perspectives and activities related to Australia's implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities as part of building a culture of safety and sustainability. The broad objective of this work is to identify practices for, and gaps for further research and development in, Australia's national implementation of the Guidelines.

In 2021, the Agency conducted a survey of Australia's implementation of the Guidelines, consisting of approximately 38 participants across industry and government, including satellite manufacturers, launch companies and universities. When asked what sustainability in space meant to them, responses included:

- (a) Responsible and safe use of space;
- (b) Preserving the space environment for future generations;
- (c) Agreed governance structures to facilitate sustainability in space.

Participants noted that sustainability in space has an influence on project planning and activities. Additionally, participants stated that the Guidelines for the Long-term Sustainability of Outer Space Activities themselves provide clarity and consistency on safe and sustainable uses of space, influence the creation of sustainable technologies and support building a responsible reputation.

Participants provided a number of examples of implementing the Guidelines for the Long-term Sustainability of Outer Space Activities within their current activities. For example, companies are considering the development of internal policies on space debris mitigation which draw on the Space Debris Mitigation Guidelines. Another example is that of universities collaborating with industry to develop innovative space debris monitoring technologies. The participants also noted some challenges in implementing the Guidelines for the Long-term Sustainability of Outer Space Activities, including the implementation of sustainability measures while maintaining commercial viability.

¹ The full text of the submission by Australia is available to members of the Working Group on the Long-term Sustainability of Outer Space Activities on the dedicated web page of the Working Group.

The Agency also consulted stakeholders to develop case studies for consideration by the second Working Group on the Long-term Sustainability of Outer Space Activities. The case studies provide an insight into experiences in implementing sections of the Guidelines, namely section A, Policy and regulatory framework for space activities; section B, Safety of space operations; and section C, International cooperation, capacity-building and awareness.²

The Agency is responsible for regulating activities that go above 100 km, or attempt to do so, or involve high-power rockets, as specified under the Space (Launches and Returns) Act 2018 and associated rules. A review of the Space Activities Act 1998 was announced by the then Minister for Industry, Innovation and Science in 2015. The aim of the review was to ensure that Australia's space regulation is appropriate to technology advancements and does not unnecessarily inhibit innovation in Australia's space capabilities. The framework was updated in 2019 to ensure that it supports the growth of the space industry by removing unnecessary barriers to participation and encouraging entrepreneurship, as well as ensuring the safety of the activities and implementing certain of our international obligations. This supports implementation of guidelines A.1 and A.2.

Australia recognizes the importance of space weather data and forecasts, and recognizes that a model and tool that can assist in the mitigation of space weather effects contributes to the sustainability of outer space and the success of the space industry. The Bureau of Meteorology ("the Bureau") has implemented measures to build space weather capability and provide space weather engagement, forecasting, research and operational activities. This is in addition to the Bureau's participation in international forums, including the World Meteorological Organization, the International Space Weather Initiative, the International Space Environment Service and the International Civil Aviation Organization. These activities support implementation of guidelines B.6, B.7 and C.1.

As part of our efforts to promote and support mutual learning in space legislation and policy, the Agency is collaborating with India, Indonesia, Japan, Malaysia, New Zealand, the Philippines, the Republic of Korea, Singapore, Thailand, Türkiye and Viet Nam through the National Space Legislation Initiative. The National Space Legislation Initiative, which was established under the Asia-Pacific Regional Space Agency Forum in 2019, seeks to promote information-sharing and mutual learning on the practices and examples of national space legislation and policies in the Asia-Pacific region, and enhance drafting capacities and implementation of national space legislation and policies in Asia-Pacific countries in accordance with international norms. These activities support implementation of guidelines C.1 and C.3.

Finally, *Advancing Space: Australian Civil Space Strategy 2019–2028* defines four strategic pillars to transform and grow Australia's space industry, including inspire. Core to the inspire pillar is the establishment of the Australian Space Discovery Centre, which seeks to raise awareness of space activities by engaging with the Australian community, including schoolchildren and tertiary audiences. The Australian Space Discovery Centre includes a number of exhibits and seminars on issues relevant to sustainability and debris mitigation. This supports implementation of guideline C.4.

Australia strongly supports the aims of the second Working Group on the Long-term Sustainability of Outer Space Activities. In our view, the sharing of experiences, practices and lessons learned from voluntary national implementation of the Guidelines is key to raising awareness of, and facilitating capacity-building in, implementation of the Guidelines as a whole. We look forward to continuing to engage with the second Working Group as we work towards supporting the safety, stability and sustainability of outer space.

² See further details of the case studies in the full text of the Australian submission.

Brazil

[Original: English]
[14 November 2022]

Review of the Guidelines for the Long-term Sustainability of Outer Space Activities: national inputs from Brazil³

Introduction

Space statecraft is changing. Due to the “New Space” movement, an intricate and manifold process of pluralization, which involves Governments, the private sector and academia venturing into space activities, space exploration has grown to be less State-dependent, and at the same time the industries have become more interdependent, in certain ways estranged from the existing United Nations treaties on outer space. The flurry of technological development and institutional innovations has led to mass-market applications of space-related technologies in realms such as agriculture, water management, land use, energy, transport, urban planning and disaster management. Concomitantly, there has been a growing tendency of using space activities to accomplish the dual challenge of tackling outer space sustainability and attaining the Sustainable Development Goals.

This complex pluralization of space activities has altered the substance of international space law-making, including the Guidelines for the Long-term Sustainability of Outer Space Activities. While not construed as a tool to exhaust the whole phenomenon of space sustainability, the Guidelines have unquestionably contributed to preventing this topic from growing extremely diverse and fragmented. In 1999, when the Vienna Declaration on Space and Human Development was adopted, including a call for protecting the space environment (para. 1 (c) of the Declaration), most of the elements of what is now considered a part of the broader agenda of space sustainability were being addressed in isolation. Space debris, the exchange of information on space events and monitoring and regulatory capacity were all relevant in their own way, but, despite occasional efforts, only became part of a unified blueprint under the chapeau of the Guidelines for the Long-term Sustainability of Outer Space Activities, adopted in 2019.

It should not come as a surprise, thus, that the first Brazilian report of the review process offers a non-exhaustive panorama of the topics spawned by space sustainability. There is an array of brief inquiries on the developments in science, industry and diplomacy, with explanations on the downstream applications of space-derived technology for the environment, economy and everyday life. Put together, these topics constitute a kaleidoscope of some of the central aspects that, for the time being, Brazil believes ought to be mulled over by the Working Group on the Long-term Sustainability of Outer Space Activities, and which can be considered either as a standalone text through a report which provides guidance within the context of the Guidelines or as a supplement and an amendment to the existing Guidelines.

The present systematization of practices and challenges is structured in a similar way to the terms of reference, methods of work and workplan (A/AC.105/1258). The first part critically analyses the challenges in the applications of space technology. The proliferation of unchecked debris and the congestion of certain orbits become mainstream issues, along with the necessity of making the Guidelines more accessible and readily useful for policymakers and other stakeholders in general. The kinship with the use of space technologies for sustainable development comes next, based on reflections on how space applications and smarter service structures already benefit countries regardless of whether they have their own space programmes, and why

³ The full text of the submission by Brazil is available to members of the Working Group on the Long-term Sustainability of Outer Space Activities on the dedicated web page of the Working Group.

research in space technologies should increase spillover effects for nations of various income levels.

Since every country's unique socioeconomic and political situation shapes the development of national policies on space and geospatial applications, the second part is dedicated to the presentation of Brazil's experience in nurturing a space programme and to the normative structure which has allowed the country to invest in forming highly qualified human capital, developing technical capability, establishing robust institutions, and accumulating scientific and technological expertise in the field. The third part of the report relates to cooperation initiatives in which Brazil has been engaged to promote regional awareness and consensus-building on the uses of space for sustainable development and on space sustainability.

Iran (Islamic Republic of)

[Original: English]
[16 November 2022]

The position paper of the Islamic Republic of Iran on the prerequisites and challenges related to the voluntary implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities

During the sixty-second session of the Committee on Peaceful Uses of Outer Space, a preamble and the 21 Guidelines for the Long-term Sustainability of Outer space Activities were adopted (A/74/20, annex II). The Committee encouraged States and international organizations to voluntarily take necessary measures and to ensure that the Guidelines would be implemented as much as possible. At the same session, it was decided that a new Working Group on the Long-term Sustainability of Outer Space Activities would, under a five-year workplan, complete the tasks of the previous Working Group, emphasizing the need to advance the following framework:

- (a) Identifying and studying challenges and considering possible new guidelines;
- (b) Sharing experiences, practices and lessons learned from the voluntary national implementation of the adopted Guidelines;
- (c) Raising awareness and building capacity, in particular among emerging space nations and developing countries (see A/74/20, para. 167).

In February 2022, at the fifty-ninth session of the Scientific and Technical Subcommittee, thanks to the efforts made by Umamaheswaran R., the Chair of the Working Group on the Long-term Sustainability of Outer Space Activities, the Working Group agreed on and adopted its terms of reference, methods of work and workplan for the period 2022–2026 and, at the same session, the Subcommittee endorsed this action (A/AC.105/1258, para. 209).

During the aforementioned sessions, the Islamic Republic of Iran, in line with the expressed views of some developing and emerging spacefaring countries, underlined the importance of the enhancement of regional and international capacity-building activities for all Member States. The preamble emphasizes that the voluntary implementation of the Guidelines is based on the technical and economic capacity of Member States. The rapid developments in space science and technology and the significant gap in the technical and economic level of States highlight the importance of capacity-building in order to adjust those imbalances. Since the Working Group is tasked with addressing “space activities risk reduction” and “safety in outer space”, all Member States, in particular developed and leading countries, need to pay special attention to such technical, scientific and economic gaps.

Given the necessity of international cooperation and contributions, which need to be conducted without discrimination of any kind, it is highly recommended that the Working Group formulate a more specific comprehensive beneficial mechanism for

achieving the most possible interest regarding capacity-building activities in the workshop organized for 2024, taking into account the interests of all Member States.

The voluntary implementation of the 21 guidelines reported by some spacefaring nations has shown their achievements and capabilities and those of their affiliated private sectors, rather than the development of a supportive approach for other countries.

While developed countries have acquired the necessary technologies and related infrastructures for the implementation of the 21 guidelines, such as active debris removal, on-orbit service and space situational awareness, developing countries are suffering from the lack of required data and infrastructures. Any further action taken by the Working Group should be well adjusted with an appropriate view of the concept of capacity-building and technology transfer.

It is conceivable that capacity-building activities and knowledge-sharing would lead to increasing the safety and sustainability of space activities. Since the spacefaring countries have dedicated considerable time and budget resources to develop their space assets on Earth and in outer space, it would be logical to protect their assets and expenditures in such a manner as to improve the safety level of the space activities of other countries through capacity-building and the transfer of knowledge. Therefore, it is highly recommended that the Office for Outer Space Affairs of the Secretariat proceed in a more supportive way to arrange some platforms to disseminate relevant information as well as knowledge required for the implementation of the Guidelines.

In reviewing section B of the Guidelines, entitled “Safety of space operations” (which could be considered as the most challenging section of these Guidelines), some challenges at the international level, from the viewpoint of developing countries, are enumerated as follows.

<i>Type of challenge</i>	<i>Description of challenge</i>
Technological limitations	Lack of required data, information, knowledge, technology and infrastructure to implement the Guidelines
States’ and private sectors’ competitive views	The predominance of a competitive environment motivated by commercial and political views, which will prevent the formation of an interactive and cooperative approach among Member States
Lack of international mechanisms	Obscurity or failure to reach an international agreement on mechanisms and standards required for implementing some guidelines that need data-sharing or consulting

In line with raising awareness and capacity-building, addressed in section C of the Guidelines, in particular for emerging space States and developing countries, given the Guidelines' constant emphasis on cooperation and participation in sharing experiences related to the long-term sustainability of space activities and developing new methods for information exchange (guideline C.2), it seems that implementation of that principle requires a more efficient mechanism.

Otherwise, this guideline will remain only as a recommendation without any guarantee of implementation. It is proposed that specific methods and formats are needed to share experiences on the long-term sustainability of space activities.

Regarding section D of the Guidelines, for the purpose of scientific and technical research and development of space activities, the Islamic Republic of Iran is of the view that promoting and supporting research, exploration and the use of outer space, which is the main goal of this paragraph, is to be implemented through the cooperation of all Member States and with the full support offered by developed countries. As is

elaborated in article 1 of the Outer Space Treaty of 1967, “there shall be freedom of scientific investigation in outer space, including the Moon and other celestial bodies, and States shall facilitate and encourage international cooperation in such investigation”. Challenges or impediments that block bilateral or multilateral cooperation in the field of space are discriminatory measures which deprive States of free access to space.

Furthermore, to maintain a successful forward-looking approach regarding long-term sustainability, the following essential notes should be taken into consideration:

- Addressing challenges associated with implementation of the Guidelines is of great importance, but concentrating only on challenges without proposing effective solutions is time-wasting.
- Deploying thousands of satellites in the near-Earth space in the form of large (mega-) constellations can cause orbital congestion and limit the free and equal access of other Member States to the peaceful exploration and use of outer space, which is recognized as the common interest of all humanity. Therefore, we believe that this challenge should be placed, and addressed as a top priority, in the agenda of the Working Group on the Long-term Sustainability of Outer Space Activities.
- Some of the present challenges are rooted in space activities carried out in the past. One of the prominent challenges the international community inherited as a major obstacle to the implementation of the Guidelines is debris that was generated in the past. Any planning for near-Earth orbit activities without considering operational acts for decreasing present debris is not in line with the safety and sustainability of outer space; in other words, it requires the “primary responsibility” of spacefaring countries.
- Space situational awareness data are vital to protect all space objects because, if access to space situational awareness data becomes limited, harmful consequences would prevail for all space actors. The mere utilization of space situational awareness by States does not guarantee safety and sustainability. Therefore, sharing space situational awareness data through an international mechanism is direly needed in order to have safe space for all States.

To conclude, the Islamic Republic of Iran believes that developing a mechanism for cooperation and information exchange is an essential requirement for the long-term sustainability of outer space. If this requirement is not fully achieved, we will witness significant challenges to implement these Guidelines, and we should note that most of the developing countries are not able to achieve the implementation the Guidelines.

New Zealand

[Original: English]
[24 November 2022]

Update on New Zealand’s voluntary implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities and approach to reporting

New Zealand welcomed the adoption of a preamble and the 21 Guidelines for the Long-term Sustainability of Outer Space Activities at the sixty-second session of the Committee on the Peaceful Uses of Outer Space in June 2019.

New Zealand recognizes the value not only in implementing the Guidelines but also in sharing approaches to implementation. States’ implementation experiences can provide valuable insights for those States currently developing their approach to implementing the Guidelines.

This paper is intended to highlight examples of efforts that New Zealand has taken to implement particular guidelines of the Guidelines for the Long-term Sustainability of Outer Space Activities. It does not represent a complete list of implementation

measures being taken. We have utilized the implementation reporting template proposed by the United Kingdom of Great Britain and Northern Ireland at the fifty-seventh session (A/AC.105/C.1/2020/CRP.15), the fifty-eighth session (A/AC.105/C.1/2021/CRP.16) and the fifty-ninth session (A/AC.105/C.1/2022/CRP.22) of the Scientific and Technical Subcommittee.

Examples of New Zealand’s approach to the voluntary implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities

Part A. Policy and regulatory framework for space activities

Guidelines A.1 and A.2	Adopt, revise and amend, as necessary, national regulatory frameworks for outer space activities; Consider a number of elements when developing, revising or amending, as necessary, national regulatory frameworks for outer space activities	New Zealand
<i>Thoughts or approach to implementation</i>	<p>New Zealand’s national space law, the Outer Space and High Altitude Activities Act, was implemented in 2017. At the time of drafting, a clause mandating a review was included in the Act. This technical review of the operation and effectiveness of the Act was completed in mid-2022 and assessed the Act’s performance against its objectives and considered how it might be improved operationally.</p> <p>The review noted that the Act had performed well overall since its implementation and made a number of recommendations to improve the Act and ensure that it continued to be fit for purpose as novel space technologies continued to be developed.</p>	
<i>Current progress and/or proposed future activities</i>	<p>The technical review of the Act made a series of recommendations to address the identified issues, including several areas where additional policy development is needed. New Zealand is currently undertaking this work to support amendments to the space regulatory framework.</p>	
<i>Experiences, challenges and lessons learned</i>	<p>When designing New Zealand’s space regulatory framework, it was important to build in flexibility. This has ensured that our regime continues to keep pace with the rapid development of space technology and operational practice, allowing for novel space activities to be adequately regulated.</p> <p>New Zealand has found conducting an in-depth operational review of our space law to be a valuable exercise in identifying areas of our regulatory regime that need revising or amending.</p>	
<i>Comments on specific needs for capacity-building necessary to support implementation</i>	<p>Both the development of our regulatory regime and the review of this regime have benefited from consideration of the space regulatory regimes of other jurisdictions.</p> <p>New Zealand would be happy to discuss both the development of a new regulatory framework for space activities and the operational review of that framework.</p>	

A.3	Supervise national space activities	New Zealand
<i>Thoughts or approach to implementation</i>	<p>To meet our obligations for “continuing supervision” of national space activities, the New Zealand Space Agency sought a way to monitor objects launched from New Zealand and verify that they are being operated safely and in accordance with the conditions set out in their permits. New Zealand collaborated with LeoLabs, a commercial radar tracking service provider for objects in Low Earth Orbit, to create a Space Regulatory and Sustainability Platform. A first of its kind among space agencies, this platform enables the New Zealand Space Agency to:</p> <ul style="list-style-type: none"> • Track and monitor objects launched from New Zealand, in real time, using the LeoLabs radar network • Set regulatory limits for specific objects and receive automated alerts when an object is outside of any prescribed parameters • Record object behaviour over time and build a catalogue of space objects launched from New Zealand, both historical and current 	
<i>Current progress and/or proposed future activities</i>	New Zealand is currently exploring an expansion of the Space Regulatory and Sustainability Platform to allow for closer monitoring of rendezvous and proximity operations.	
<i>Experiences, challenges and lessons learned</i>	<p>Supervision challenges we have encountered are:</p> <ul style="list-style-type: none"> • Operationalizing the licensing and monitoring of novel space activities such as rendezvous and proximity operations • Data from monitoring tools not always allowing for clear conclusions on the origin of objects observed in space • Determining our approach to compliance and enforcement in relation to an object in orbit that is non-compliant 	
<i>Comments on specific needs for capacity-building necessary to support implementation</i>	New Zealand would be happy to share more about the Space Regulatory and Sustainability Platform, including the process of setting up the Platform with LeoLabs.	

A.5	Enhance the practice of registering space objects	New Zealand
<i>Thoughts or approach to implementation</i>	<p>New Zealand’s view on the registration of space objects aligns with United Nations guidance (General Assembly resolution 62/101), which notes that the State responsible for the operation of the space object should register the satellite. In general, States providing launch services (such as New Zealand) do not register satellites launched on behalf of foreign satellite operators.</p> <p>New Zealand recognizes the importance of the registration of space objects. Where needed, New Zealand works with the relevant authority of another State to reach agreement on</p>	

	which State should register a satellite and ensure space objects launched from New Zealand are registered.
<i>Current progress and/or proposed future activities</i>	New Zealand recently participated in an Office for Outer Space Affairs technical advisory mission held in the Philippines. The purpose of the event is to support emerging spacefaring nations to develop their national space law and policy. New Zealand’s topic was “setting up and operating a national space registry”. New Zealand will be participating in two further such events on the same topic in November 2022 (Malaysia) and December 2022(Thailand).
<i>Experiences, challenges and lessons learned</i>	<p>Registration challenges we are encountering are:</p> <ul style="list-style-type: none"> • Not all States have space laws despite national entities carrying out space activities. • The laws of some States do not capture all space activities carried out by nationals. • Some States coordinate radio spectrum activities on a commercial basis for foreign nationals. <p>This creates gaps in the international registration regime.</p> <p>If agreement is not reached on which State will register the space object, New Zealand will register a space object as a last resort. We do not consider this desirable because we have limited jurisdiction and control over satellites operated overseas.</p> <p>New Zealand encourages other States to follow the guidance of the Office for Outer Space Affairs on registration and to implement national space laws that cover the full range of activities carried out by their nationals.</p>
<i>Comments on specific needs for capacity-building necessary to support implementation</i>	New Zealand would welcome further engagement on our registration practices.

Part B. Safety of space operations

B.2	Improve accuracy of orbital data on space objects and enhance the practice and utility of sharing orbital information on space objects	New Zealand
<i>Thoughts or approach to implementation</i>	New Zealand currently requires operators seeking to launch objects smaller than 10 cm to launch to an altitude below 390 km, or to demonstrate that they can be detected and tracked at a level equivalent to a 1U (10 cm) CubeSat. This ensures that any very small space objects can either be accurately tracked or will achieve demise quickly and below the orbits of crewed spacecraft.	
<i>Current progress and/or proposed future activities</i>	New Zealand is monitoring advances in space situational awareness on the trackability of very small satellites.	

<i>Experiences, challenges and lessons learnt</i>	<p>It can be difficult for less established operators, which may use satellites in a form factor smaller than 10 cm, to demonstrate how trackable their space objects are.</p> <p>Our compliance monitoring tool relies on the 18th Space Defense Squadron or operators to self-identify their objects. This can sometimes lead to a number of “unknown” objects which fall under our jurisdiction and take time to identify.</p>
<i>Comments on specific needs for capacity-building necessary to support implementation</i>	<p>Models for determining the trackability of satellites smaller than 10 cm prior to launch would be useful for less established operators.</p>

Part D. Scientific and technical research and development

D.2	Investigate and consider new measures to manage the space debris population in the long term	New Zealand
<i>Thoughts or approach to implementation</i>	<p>New Zealand recognizes the importance of active debris removal and on-orbit servicing for managing the space debris population in Earth orbit.</p> <p>New Zealand has developed a regulatory approach to active debris removal and on-orbit servicing activity, predicated on safety, openness and transparency, in order to build trust and confidence within the international community for these novel space activities.</p>	
<i>Current progress and/or proposed future activities</i>	<p>The Government of New Zealand funded a study conducted by Astroscale, Rocket Lab and Te Pūnaha Ātea–Auckland Space Institute which defined the engineering requirements, policy challenges and associated costs for multi-active debris removal missions.</p>	
<i>Experiences, challenges and lessons learned</i>	<p>New Zealand has faced a number of challenges in developing and implementing a regulatory approach to active debris removal and on-orbit servicing activities. In particular, there are a number of policy and legal issues associated with multi-State active debris removal and on-orbit servicing missions.</p>	
<i>Comments on specific needs for capacity-building necessary to support implementation</i>	<p>New Zealand would welcome the opportunity to discuss other States’ experiences and approaches to licencing active debris removal and on-orbit servicing activity in a safe and transparent manner.</p>	

Norway

[Original: English]
[15 November 2022]

Report on the voluntary implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities in Norway

Introduction

The long-term sustainability of outer space is of high priority for Norway, and we welcome the adoption of the 21 Guidelines for the Long-term Sustainability of Outer Space Activities. We also commend the establishment of the new Working Group on Long-term Sustainability of Outer Space Activities and look forward to contributing to it. Norway is presently in the process of considering how to best implement the Guidelines at the national level.

The Norwegian Space Law of 1969 is currently being revised and will soon be replaced by a new space law. The new law will, among other things, provide a framework for space activities such as the registering of space objects, the supervision of space activities, sanctions and liability.

Awaiting the entry-into-force of Norway's new space law and affiliated regulations, this preliminary report constitutes the status of implementation of certain guidelines. A more extensive report will follow.

The focus of the report is mainly on national measures.

Section A. Policy and regulatory framework for space activities

Guideline A.1. Adopt, revise and amend, as necessary, national regulatory frameworks for outer space activities

The Norwegian Space Law of 1969 is currently being revised and will soon be replaced by a new space law. The new law will, among other things, provide a framework for space activities such as registering of space objects, the supervision of space activities, sanctions and liability.

Guideline A.2. Consider a number of elements when developing, revising or amending, as necessary, national regulatory frameworks for outer space activities

Norway is currently in the process of revising the national regulatory framework for outer space activities. The draft process considers the elements recommended in guideline A.2. Norway looks forward to reporting on this once the new law is adopted.

Guideline A.3. Supervise national space activities

The Ministry of Industry, Trade and Fishery is the authority overseeing space activities conducted with a licence granted in line with the law of 1969. The Government has decided to set up a new national authority at the Civil Aviation Authority to oversee space activities from 2023.

Guideline A.4: Ensure the equitable, rational and efficient use of the radio frequency spectrum and the various orbital regions used by satellites

Norway is a member State of the International Telecommunication Union.

The Norwegian Communication Authority is the responsible authority overseeing spectrum use in Norway in accordance with the EKOM law.

Guideline A.5: Enhance the practice of registering space objects

Norway is party to the Convention on Registration of Objects Launched into Outer Space of 1974. The Ministry of Foreign Affairs is responsible for the national registrations in accordance with Norway's international obligations. Currently the

Norwegian Space Agency (NOSA) maintains the national registry for space objects. The registry is, however, planned to be transferred to the Civil Aviation Authority as of 2023. The Foreign Ministry reports relevant information to the Office for Outer Space Affairs. As a consequence of the development in the Norwegian space sector, including launches from the Andøya Spaceport, registration practices will be developed in line with guideline A.5.

Section B. Safety of space operations

Guideline B.1: Provide updated contact information and share information on space objects and orbital events

Norway is currently evaluating the need for space situational awareness, and which government body should be responsible for this. Norway is participating in the European Union and the European Space Agency (ESA) space programmes relevant for space situational awareness.

Guideline B.6: Share operational space weather data and forecasts

Norway shares relevant observations useful for monitoring space weather to, for example, ESA and World Data Center for non-commercial use. Sharing of space weather forecast is, however, more limited since we do not yet have a 24/7 national space weather service.

Section C. International cooperation, capacity-building and awareness

Guideline C.1: Promote and facilitate international cooperation in support of the long-term sustainability of outer space activities

Norway participates in international cooperation on sustainable use of outer space in the Committee on the Peaceful Uses of Outer Space, and in international organizations such as ESA, the European Union and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT). In addition, Norway has bilateral agreements with several nations.

Guideline C.3: Promote and support capacity-building

NOSA has been cooperating with the Scandinavian Institute of Maritime Law at the University of Oslo in arranging space law seminars. NOSA has also supported the European Centre for Space Law in hosting a space law symposium in Oslo.

Guideline C.4: Raise awareness of space activities

NOSA is involved in various matters regarding raising awareness of space activities, and has, among others, together with the Norwegian Center for Climate Research, hosted a seminar on climate and satellites. Furthermore, NOSA is, in cooperation with the University of Oslo and the Norwegian University of Science and Technology, hosting arrangements on studies in the space sector in Norway and internationally. Norway will host the International Astronautical Federation Global Space Conference on Climate Change in 2023.

European Space Agency

[Original: English]
[28 November 2022]

European Space Agency input for the Working Group on the Long-term Sustainability of Outer Space Activities

1. Identifying and studying challenges

Space debris

For decades, the European Space Agency (ESA) has been active in space debris research and monitoring, which it recognizes as one of the biggest challenges of space flight. In 2019, ESA signed a joint statement with the Office for Outer Space Affairs on their intention to cooperate on the increased risk of space debris, recognizing it as one of the growing challenges to be addressed in order to ensure the sustainable and long-term use of outer space.⁴ In this respect, ESA not only applies non-legally binding standards on space debris mitigation but has recently adopted the Ministerial Council Resolution on Accelerating the Use of Space in Europe,⁵ wherein ESA member States encourage the Director General to implement a zero-debris approach for ESA missions. Preparing and conducting operations on the active removal of space objects and observing measures for the safe conduct of proximity operations are ongoing issues not yet addressed by the current Guidelines for the Long-term Sustainability of Outer Space Activities; however, those issues are paramount for fostering technological advancements for the sustainable use of outer space.

Assistance and voluntary implementation

Many States members of the Committee on the Peaceful Uses of Outer Space as well as several permanent observers regularly update the Committee on their voluntary implementation of the Guidelines. The question remains, however, as to whether further support is needed in the form of technical and legal advice regarding, inter alia, the implementation of the Guidelines for States and other institutions, as this type of concrete support for the implementation would help bolster their international application. Developing a mechanism for the periodic review of the adoption and implementation of the existing Guidelines, as well as providing technical and legal assistance, needs to be given priority in this respect.

Additionally, such support could also assist industry in their implementation and provide for legal clarity, transparency and security. The implementation of voluntary guidelines should occur not only at the governmental level but go beyond this by creating an incentive and openly inviting industry to both implement the Guidelines and to actively develop technologies to help advance their implementation. ESA applies internally binding policies to the procurement of ESA space systems and to operations under its responsibility of any given space system. The Working Group might therefore wish to propose means of ensuring not only that States implement the Guidelines but also that industry and other non-governmental entities are aware of them and are being encouraged to work on technological advancements to allow for their thorough implementation.

Cooperation and information-sharing

The Guidelines for the Long-term Sustainability of Outer Space Activities call for multilateral cooperation and information-sharing in many forms (including space debris monitoring information, orbital information on space objects, and interpretation and usage of conjunction assessment results). However, international coordination mechanisms and information-sharing measures are needed to ensure that

⁴ The full statement (UNIS/OS/510) is available at www.unoosa.org/oosa/en/informationfor/media/2019-unis-os-510.html.

⁵ Available at https://esamultimedia.esa.int/docs/corporate/Resolution_1_CM22.pdf.

cooperation and data-sharing are done in an efficient, reliable and transparent manner among both public institutions and non-governmental entities.

Data exchange requires agreed formats and standardization. ESA is very active in different standardization bodies, contributing to the development of information-sharing procedures and transparent standards for the exchange of data. In order to understand the most urgent needs of new activities, ESA coordinated an exercise to map existing and draft space situational awareness standards. Within the mapping exercise, specific guidelines of the Guidelines for the Long-term Sustainability of Outer Space Activities were identified that are currently covered by existing standardization bodies (including the International Organization for Standardization, the European Cooperation for Space Standardization, the Consultative Committee for Space Data Systems, the European Committee for Standardization and the European Committee for Electrotechnical Standardization), while others have not been incorporated by any such body. The mapping identified gaps related to specific guidelines, which could be further concretized by continuous efforts and a final publication of the mapping results. This would allow for an up-to-date overview of the implementation of the Guidelines for the Long-term Sustainability of Outer Space Activities by standardization bodies.

2. Sharing experiences, practices and lessons learned

ESA conducts its space activities in line with the Guidelines for the Long-term Sustainability of Outer Space Activities, in particular those related to the safety of space operations, as referred to below, and through international cooperation. The promotion and facilitation of international cooperation in the space domain remains at the heart of ESA programmes and activities (guideline C.1). In February 2022, ESA presented a conference room paper (A/AC.105/C.1/2022/CRP.14/Rev.1) at the fifty-ninth session of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space. The paper related to the Agency's implementation of the Guidelines,⁶ addressing each of the individual guidelines alongside past and present ESA activities that are considered achievements and actions in the spirit of, and in response to, a specific guideline.

In the last few years, ESA has continuously provided tailored training courses to support capacity-building in Governments and space agencies. In many cases, these training courses are followed by concrete support mechanisms or technical assistance agreements (guideline C.3). ESA maintains a free-of-charge service⁷ supporting researchers, mission designers and operators through its software tools, inter alia, DRAMA and MASTER, and information services, inter alia, DISCOS, as well as re-entry and fragmentation information web portals for assessing or implementing space debris requirements in the design and operation of satellite missions. ESA services on collision avoidance, risk assessment and provision of expertise are therefore available to commercial partners upon request (guideline C.2). The space debris user portal currently has about 7,000 registered global users and is accessed by an average of 100 users per day.

Through involvement in ESA programmes and the use of the Agency's technical resources and facilities, ESA member States and their respective industries are implementing many of the Guidelines for the Long-term Sustainability of Outer Space Activities, in particular guidelines B.1 (Provide updated contact information and share information on space objects and orbital events), B.2 (Improve accuracy of orbital data on space objects and enhance the practice and utility of sharing orbital information on space objects), B.3 (Promote the collection, sharing and dissemination of space debris monitoring information), B.4 (Perform conjunction assessment during all orbital phases of controlled flight) and B.8 (Design and operation of space objects

⁶ Available at www.unoosa.org/res/oosadoc/data/documents/2022/aac_105c_12022crp/aac_105c_12022crp_14rev_1_0_html/AC105_C1_2022_CRP14ERev01.pdf.

⁷ Via the space debris user portal available at <https://sdup.esoc.esa.int>.

regardless of their physical and operational characteristics). The Agency's technical and programmatic developments often concern newer and cleaner technology models, developing innovative solutions and engaging relevant actors to discuss the potential way forward. Member States also rely on the Agency's technical review opportunities.

ESA updated its Space Debris Mitigation Policy for Agency Projects⁸ in 2022, applying the newest International Organization for Standardization standard on space debris mitigation requirements (ISO 24113:2019) as contained in ECSS-U-AS-10C, Rev.1 (guideline A.2 and guideline A.4). Both standards were already included in the List of ESA Applicable Standards and are binding for all Agency projects through their inclusion in the Space Debris Mitigation Policy.

An example of the Agency's efforts to further sustainability is the recently conducted the Zero Debris Concurrent Design Facility study, which was aimed at defining concrete recommendations for the applicability and implementation of a zero debris approach on future ESA missions. Given that such an approach cannot be implemented solely on a policy level without the technological capabilities to do so, ESA involved multiple actors from the European space sector in the study to allow for possible technical maturity by 2030. ESA also collaborates with and supports other institutional and commercial space operators willing to adopt similar approaches in the future, truly acting as a pioneer in the development of new technologies and internal policies.⁹ In addition, ESA is, together with relevant actors within industry, driving sustainable technological advancements forward by developing technology to actively remove an ESA registered space object from orbit. The ClearSpace-1 mission will be launched in 2025/2026 and will showcase a model needed for the future of commercial debris removal services, dependent on the essential role of industry, while also serving as an introduction to the future removal services market.

3. Raising awareness and building capacity

As an international intergovernmental organization, ESA is neither subject to, nor can it enact, national space legislation. However, it actively supports member States, at their request, in their individual efforts concerning the establishment and implementation of national space legislation through the provision of technical and legal advice (guideline A.1 and guideline A.3). This has been recognized and encouraged by ESA member States in several instances, most recently in the Ministerial Council Resolution on Accelerating the Use of Space in Europe, in which ESA member States noted their appreciation of the Agency's continued support in the establishment and implementation of national space legislation and for its provision of continuous opportunities for exchange and coordination of positions related to international space law. In support of the awareness-raising laid out in the Guidelines for the Long-term Sustainability of Outer Space Activities, ESA continues to issue the publicly available *Annual Space Environment Report*.¹⁰ The purpose of the Report is to provide a transparent overview of global space activities; to estimate the impact of these activities on the space environment; and to quantify the effect of internationally endorsed mitigation measures aimed at improving the sustainability of space flight.

ESA and the European Centre for Space Law offer a large variety of courses, events, workshops and symposiums to an ever-growing space law and policy network across Europe and beyond, related to capacity-building in fields of relevance to the sustainability of space activities (guideline C.1). These events are directed towards industry professionals, ministry officials, academia and students. The Centre's activities are regularly summarized in preparatory papers for the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space. During this year's

⁸ ESA/ADMIN/IPOL(2014)2.

⁹ A list of other ESA concurrent design facility studies related to technology developments is available at www.esa.int/Enabling_Support/Space_Engineering_Technology/CDF/Studies_Reviews.

¹⁰ The sixth extended issue, released in April 2022, is available at www.sdo.esoc.esa.int/environment_report/Space_Environment_Report_latest.pdf.

International Astronautical Congress, the Centre held an event dedicated to raising awareness of the role of law and policy in fostering a sustainable space sector.

4. Conclusion

The adoption of the Guidelines for the Long-term Sustainability of Outer Space Activities by the Committee on the Peaceful Uses of Outer Space in 2019 marked an important step in the recognition of an internationally accepted set of best practices, agreed upon by the then 92 States members of the Committee. However, the commercial space sector continues to evolve rapidly, and space sustainability constitutes a global challenge that can be appropriately addressed by anticipating further developments and following technological trends in the sector, and through multilateral space diplomacy in the context of the Committee on the Peaceful Uses of Outer Space, where States should continue to share their experiences in the implementation of the Guidelines by reporting to the Committee. Additionally, fostering the essential technological advancements required to further the sustainable use of outer space remains at the core of addressing this issue. The significance of the Guidelines for the Long-term Sustainability of Outer Space Activities cannot be considered without looking towards their further development to encompass and reflect the rapid technological developments currently taking place in the space sector.

European Organization for Astronomical Research in the Southern Hemisphere

[Original: English]

[9 November 2022]

Input by the European Organization for Astronomical Research in the Southern Hemisphere in response to the invitation to the informal consultations of the Working Group on the Long-term Sustainability of Outer Space Activities

The European Organization for Astronomical Research in the Southern Hemisphere is an intergovernmental organization with a mission to design, construct and operate world-leading astronomical observatories and to foster international cooperation in science.

The Organization is currently constructing the Extremely Large Telescope on Cerro Armazones, Chile. With a primary mirror measuring 39 metres in diameter, the Extremely Large Telescope will be the world's largest optical and infrared telescope upon its "first light" at the end of this decade. The Extremely Large Telescope will be a powerful machine for exploring outer space; it will track down Earth-like planets around other stars and search for evidence of life outside our solar system. It will also probe the furthest reaches of the cosmos, revealing the properties of the very earliest galaxies and the nature of the dark universe. The Organization also supports and develops the Atacama Large Millimetre/submillimetre Array, which is an international partnership between Europe – represented by the European Organization for Astronomical Research in the Southern Hemisphere – North America and East Asia, in cooperation with Chile. The Very Large Telescope and its interferometer continue to be at the forefront of optical astronomy. With the support of the Organization's 16 member States, the host State, Chile, and the strategic partner, Australia, the Organization continues to be the world's most productive astronomical observatory, providing a range of world-leading facilities to astronomers from around the world and enabling amazing scientific discoveries, for the peaceful exploration of outer space and for the benefit of humankind.

In addition to its intrinsic scientific value, the immense value of astronomy in providing critical functions to space exploration, space science, and planetary defence, in stimulating interest in scientific and technical studies and careers, and in building national capacity for space capability is well recognized. Its importance was also recognized by the Committee on the Peaceful Uses of Outer Space at its sixty-

fifth session, the report of which states that the inclusion of the item on dark and quiet skies for science and society on the agenda of the Science Technical and Subcommittee is “...an important recognition of the fact that astronomical observations for both optical and radio astronomy were an essential aspect of space activities and should be protected from interference” (A/77/20, para. 182).

Nonetheless, the future of astronomy is threatened by current challenges. There is a necessary reflection to be made on the increasing number of artificial space objects, particularly satellite constellations placed in low Earth orbit with the purpose of providing global communications. While these developments present both challenges and opportunities, the astronomy community has raised great concerns about their impact on the ability to conduct fundamental science.

The challenge posed by large constellations to the long-term sustainability of outer space is already recognized in the Guidelines for the Long-term Sustainability of Outer Space Activities, which, in its background section, reads: “the proliferation of space debris, the increasing complexity of space operations, the emergence of large constellations and the increased risks of collision and interference with the operation of space objects may affect the long-term sustainability of space activities” (A/74/20, annex II, para. 1). Nevertheless, concerns related to astronomy are yet to be addressed within the Working Group.

With this in mind, and in accordance with the guiding framework of the Working Group on the Long-term Sustainability of Outer Space Activities (A/74/20, para. 167), the European Organization for Astronomical Research in the Southern Hemisphere is aligning itself with the related submission prepared by the International Astronomical Union, which encourages the Working Group to raise awareness and consider how to ensure the sustainability of access to scientific knowledge from the night sky. In this regard, the Organization is of the view that the protection of the dark and quiet sky from the negative impact of large constellations of satellites in low Earth orbit should be addressed at a high level by the Working Group on the Long-term Sustainability of Outer Space Activities.

The Organization also encourages the Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee to support mechanisms to continue dialogue on and exploration of mitigation measures to protect dark and quiet skies at a detailed level, including by maintaining an agenda item on the topic until the issue is satisfactorily resolved.
