



**Committee on the Peaceful
Uses of Outer Space**
Fifty-ninth session
Vienna, 8-17 June 2016**Draft report**Annex¹**Guidelines for the long-term sustainability of outer space
activities: first set****A. Policy and regulatory framework for space activities**

Guidelines 1, 2, 3 and 4 provide guidance on the development of policies, regulatory frameworks and practices that support the long-term sustainability of outer space activities for Governments and relevant international intergovernmental organizations authorizing or conducting space activities.

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

1.1 States should adopt, revise and amend, as necessary, national regulatory frameworks for outer space activities, taking into account their obligations under the United Nations treaties on outer space as States responsible for national activities in outer space and as launching States. When adopting, revising, amending or implementing national regulatory frameworks, States should

¹ The guidelines contained in the present annex were agreed upon by the Working Group on the Long-term Sustainability of Outer Space Activities of the Scientific and Technical Subcommittee and by the Committee on the Peaceful Uses of Outer Space at the fifty-ninth session of the Committee. The Working Group will continue to consider the remaining draft proposed guidelines, as outlined in its extended workplan (para. [...] of the present report), with a view to compiling a full compendium of guidelines for the long-term sustainability of outer space activities, for adoption by the Committee at its sixty-first session, in 2018.



consider the need to ensure and enhance the long-term sustainability of outer space activities.

1.2 With the increase of outer space activities by governmental and non-governmental actors from around the world, and considering that States bear international responsibility for the space activities of non-governmental entities, States should adopt, revise or amend regulatory frameworks to ensure the effective application of relevant, generally accepted international norms, standards and practices for the safe conduct of outer space activities.

1.3 When developing, revising, amending or adopting national regulatory frameworks, States should consider the provisions of General Assembly resolution 68/74, on recommendations on national legislation relevant to the peaceful exploration and use of outer space. In particular, States should consider not only existing space projects and activities but also, to the extent practicable, the potential development of their national space sector, and envisage appropriate, timely regulation in order to avoid legal lacunae.

1.4 States, in enacting new regulations, or in revising or amending existing legislation, should bear in mind their obligations under article VI 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. Traditionally, national regulations have been concerned with issues such as safety, liability, reliability and cost. As new regulations are developed, States should consider regulations that enhance the long-term sustainability of outer space activities. At the same time, regulations should not be so prescriptive as to prevent initiatives addressing the long-term sustainability of outer space activities.

Guideline 2

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

2.1 When developing, revising or amending, as necessary, regulatory measures applicable to the long-term sustainability of outer space activities, States and international intergovernmental organizations should implement international obligations, including those arising under the United Nations space treaties to which they are party.

2.2 In developing, revising or amending, as necessary, national regulatory frameworks, States and international intergovernmental organizations should:

(a) Consider the provisions of General Assembly resolution 68/74, on recommendations on national legislation relevant to the peaceful exploration and use of outer space;

(b) Implement space debris mitigation measures, such as the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, through applicable mechanisms;

(c) Address, to the extent practicable, risks to people, property, public health and the environment associated with the launch, in-orbit operation and re-entry of space objects;

(d) Promote regulations and policies that support the idea of minimizing the impacts of human activities on Earth as well as on the outer space environment. They are encouraged to plan their activities based on the Sustainable Development Goals, their main national requirements, and international considerations for the sustainability of space and the Earth;

(e) Implement the guidance contained in the Safety Framework for Nuclear Power Source Applications in Outer Space and satisfy the intent of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space through applicable mechanisms that provide a regulatory, legal and technical framework that sets out responsibilities and assistance mechanisms, prior to using nuclear power sources in outer space;

(f) Consider the potential benefits of using existing international technical standards, including those published by the International Organization for Standardization (ISO), the Consultative Committee for Space Data Systems and national standardization bodies. In addition, States should consider the utilization of recommended practices and voluntary guidelines proposed by the Inter-Agency Space Debris Coordination Committee and the Committee on Space Research;

(g) Weigh the costs, benefits, disadvantages and risks of a range of alternatives and ensure that such measures have a clear purpose and are implementable and practicable in terms of the technical, legal and management capacities of the State imposing the regulation. Regulations should also be efficient in terms of limiting the cost for compliance (e.g., in terms of money, time or risk) compared with feasible alternatives;

(h) Encourage advisory input from affected national entities during the process of developing regulatory frameworks governing space activities to avoid unintended consequences of regulation that might be more restrictive than necessary or that conflicts with other legal obligations;

(i) Examine and adapt existing relevant legislation to ensure its compliance with these guidelines, considering the need for transition periods appropriate to their level of technical development.

Guideline 3

Supervise national space activities

3.1 In supervising space activities of non-governmental entities, States should ensure that entities under their jurisdiction and/or control that conduct outer space activities have the appropriate structures and procedures for planning and conducting space activities in a manner that supports the objective of enhancing the long-term sustainability of outer space activities, and that they have the means to comply with relevant national and international regulatory frameworks, requirements, policies and processes in this regard.

3.2 States bear international responsibility for national activities in outer space and for the authorization and continuing supervision of such activities, which are to be carried out in conformity with applicable international law. In fulfilling

this responsibility, States should encourage each entity conducting space activities to:

(a) Establish and maintain all the necessary technical competencies required to conduct the outer space activities in a safe and responsible manner and to enable the entity to comply with the relevant governmental and intergovernmental regulatory frameworks, requirements, policies and processes;

(b) Develop specific requirements and procedures to address the safety and reliability of outer space activities under the entity's control, during all phases of a mission life cycle;

(c) Assess all risks to the long-term sustainability of outer space activities associated with the space activities conducted by the entity, in all phases of the mission life cycle, and take steps to mitigate such risks to the extent feasible.

3.3 In addition, States are encouraged to designate a responsible entity or entities to plan, coordinate and assess space activities with the aim of promoting their effectiveness in supporting the Sustainable Development Goals and in supporting the objectives of the guidelines for the long-term sustainability of outer space activities in a broader perspective and vision.

3.4 States should ensure that the management of an entity that conducts outer space activities establishes structures and procedures for planning and conducting space activities in a manner that supports the objective of promoting the long-term sustainability of outer space activities. Appropriate measures to be taken by management in this regard should include:

(a) A commitment at the highest levels of the entity to promoting the long-term sustainability of outer space activities;

(b) Establishing and fostering an organizational commitment to promoting the long-term sustainability of outer space activities within the entity, as well as in relevant interactions with other entities;

(c) Urging, to the extent practicable, that the entity's commitment to the long-term sustainability of outer space activities is reflected in its management structure and procedures for planning, developing and conducting outer space activities;

(d) Encouraging, as appropriate, the sharing of the experiences of the entity in the conduct of safe and sustainable outer space activities as a contribution by the entity to enhancing the long-term sustainability of outer space activities;

(e) Designating a contact point within the entity responsible for communication with relevant authorities to facilitate efficient and timely sharing of information and coordination of potentially urgent measures to promote the safety and sustainability of outer space activities.

3.5 States should ensure that appropriate communication and consultation mechanisms are in place within and among the competent bodies that oversee or conduct space activities. Communication within and among relevant regulatory bodies can promote regulations that are consistent, predictable and transparent so as to ensure that regulatory outcomes are as intended.

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

4.1 In fulfilling their obligations under the Constitution and the Radio Regulations of the International Telecommunication Union (ITU), States should pay particular attention to the long-term sustainability of space activities and sustainable development on Earth and to facilitating the prompt resolution of identified harmful radio frequency interference.

4.2 As provided for in article 44 of the ITU Constitution, radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources that must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of developing countries and the geographical situation of particular countries.

4.3 Consistent with the purpose of article 45 of the ITU Constitution, States and international intergovernmental organizations should ensure that their space activities are conducted in such a manner as not to cause harmful interference with the reception and transmission of radio signals related to the space activities of other States and international intergovernmental organizations, as one of the means of promoting the long-term sustainability of outer space activities.

4.4 In their use of the electromagnetic spectrum, States and international intergovernmental organizations should consider the requirements for space-based Earth observation systems and other space-based systems and services in support of sustainable development on Earth, in accordance with the ITU Radio Regulations and the ITU-R Recommendations.

4.5 States and international intergovernmental organizations should ensure the implementation of the radio regulation procedures established by ITU for space radio links. Moreover, States and international intergovernmental organizations should encourage and support regional and international cooperation aimed at improving efficiency in decision-making and implementation of practical measures to eliminate identified harmful radio frequency interference in space radio links.

4.6 Spacecraft and launch vehicle orbital stages that have terminated their operational phases in orbits that pass through the low-Earth orbit (LEO) region should be removed from orbit in a controlled fashion. If this is not possible, they should be disposed of in orbits that avoid their long-term presence in the LEO region. Spacecraft and launch vehicle orbital stages that have terminated their operational phases in orbits that pass through the geosynchronous Earth orbit (GEO) region should be left in orbits that avoid their long-term interference with the GEO region. For space objects in or near the GEO region, the potential for future collisions can be reduced by leaving objects at the end of their mission in an orbit above the GEO region such that they will not interfere with, or return to, the GEO region.

B. Safety of space operations

Guidelines 12, 13, 16 and 17 provide guidance to Governments and relevant international intergovernmental organizations on the conduct of space operations in a manner that supports the long-term sustainability of outer space activities.

Guideline 12

Improve accuracy of orbital data on space objects and enhance the practice and utility of sharing orbital information on space objects

12.1 States and international intergovernmental organizations should promote the development and use of techniques and methods to improve the accuracy of orbital data for spaceflight safety and the use of common, internationally recognized standards when sharing orbital information on space objects.

12.2 Recognizing that spaceflight safety strongly depends upon the accuracy of orbital and other relevant data, States and international intergovernmental organizations should promote techniques and the investigation of new methods to improve such accuracy. Those methods could include national and international activities to improve the capabilities and geographical distribution of existing and new sensors, use of passive and active on-orbit tracking aids, and combining and validating data from different sources. Special attention should be paid to encouraging the participation and capacity-building of developing countries with emerging space capabilities in this domain.

12.3 When sharing orbital information on space objects, operators and other appropriate entities should be encouraged to use common, internationally recognized standards to enable collaboration and information exchange. Facilitating greater shared awareness of the current and predicted location of space objects would enable timely prediction and prevention of potential collisions.

Guideline 13

Promote the collection, sharing and dissemination of space debris monitoring information

13.1 States and international intergovernmental organizations should encourage the development and use of relevant technologies for the measurement, monitoring and characterization of the orbital and physical properties of space debris. States and international intergovernmental organizations should also promote the sharing and dissemination of derived data products and methodologies in support of research and international scientific cooperation on the evolution of the orbital debris population.

Guideline 16

Share operational space weather data and forecasts

16.1 States and international intergovernmental organizations should support and promote the collection, archiving, sharing, intercalibration, long-term continuity and dissemination of critical space weather data and space weather model outputs

and forecasts, where appropriate in real time, as a means of enhancing the long-term sustainability of outer space activities.

16.2 States should be encouraged to monitor, to the extent feasible, space weather continuously and to share data and information with the aim of establishing an international space weather database network.

16.3 States and international intergovernmental organizations should support the identification of data sets critical for space weather services and research and should consider adopting policies for the free and unrestricted sharing of critical space weather data from their space- and ground-based assets. All governmental, civilian and commercial space weather data owners are urged to allow free and unrestricted access to, and archival of, such data for mutual benefit.

16.4 States and international intergovernmental organizations should also consider sharing real-time and near-real-time critical space weather data and data products in a common format, promote and adopt common access protocols for their critical space weather data and data products, and promote the interoperability of space weather data portals, thus promoting ease of data access for users and researchers. The real-time sharing of these data could provide a valuable experience for sharing in real time other kinds of data relevant to the long-term sustainability of outer space activities.

16.5 States and international intergovernmental organizations should further undertake a coordinated approach to maintaining the long-term continuity of space weather observations and identifying and filling key measurement gaps, so as to meet critical needs for space weather information and/or data.

16.6 States and international intergovernmental organizations should identify high-priority needs for space weather models, space weather model outputs and space weather forecasts and adopt policies for free and unrestricted sharing of space weather model outputs and forecasts. All governmental, civilian and commercial space weather model developers and forecast providers are urged to allow free and unrestricted access to and archival of space weather model outputs and forecasts for mutual benefit, which will promote research and development in this domain.

16.7 States and international intergovernmental organizations should also encourage their space weather service providers to:

(a) Undertake comparisons of space weather model and forecast outputs with the goal of improved model performance and forecast accuracy;

(b) Openly share and disseminate historical and future critical space weather model outputs and forecast products in a common format;

(c) Adopt common access protocols for their space weather model outputs and forecast products to the extent possible, to promote their ease of use by users and researchers, including through interoperability of space weather portals;

(d) Undertake coordinated dissemination of space weather forecasts among space weather service providers and to operational end users.

Guideline 17

Develop space weather models and tools and collect established practices on the mitigation of space weather effects

17.1 States and international intergovernmental organizations should undertake a coordinated approach to identifying and filling gaps in research and operational models and forecasting tools required to meet the needs of the scientific community and of the providers and users of space weather information services. Where possible, this should include coordinated efforts to support and promote research and development to further advance space weather models and forecasting tools, incorporating the effects of the changing solar environment and evolving terrestrial magnetic field as appropriate, including within the context of the Committee on the Peaceful Uses of Outer Space and its Subcommittees, as well as in collaboration with other entities such as the World Meteorological Organization and the International Space Environment Service.

17.2 States and international intergovernmental organizations should support and promote cooperation and coordination on ground- and space-based space weather observations, forecast modelling, satellite anomalies and reporting of space weather effects in order to safeguard space activities. Practical measures in this regard could include:

(a) Incorporating current and forecast space weather thresholds into space launch criteria;

(b) Encouraging satellite operators to cooperate with space weather service providers to identify the information that would be most useful to mitigate anomalies and to derive recommended specific guidelines for on-orbit operations. For example, if the radiation environment is hazardous, this might include actions to delay the uploading of software, implementation of manoeuvres, etc.;

(c) Encouraging the collection, collation and sharing of information relating to ground- and space-based space weather-related impacts and system anomalies, including spacecraft anomalies;

(d) Encouraging the use of a common format for reporting space weather information. In relation to the reporting of spacecraft anomalies, satellite operators are encouraged to take note of the template proposed by the Coordination Group for Meteorological Satellites;

(e) Encouraging policies promoting the sharing of satellite anomaly data related to space weather-induced effects;

(f) Encouraging training on and knowledge transfer relating to the use of space weather data, taking into account the participation of countries with emerging space capabilities.

17.3 It is acknowledged that some data may be subject to legal restrictions and/or measures for the protection of proprietary or confidential information, in accordance with national legislation, multilateral commitments, non-proliferation norms and international law.

17.4 States and international intergovernmental organizations should work towards the development of international standards and the collection of established

practices applicable for the mitigation of space weather effects in satellite design. This could include sharing of information on design practices, guidelines and lessons learned relating to mitigation of the effects of space weather on operational space systems, as well as documentation and reports relating to space weather user needs, measurement requirements, gap analyses, cost-benefit analyses and related space weather assessments.

17.5 States should encourage entities under their jurisdiction and/or control to:

(a) Incorporate in satellite designs the capability to recover from a debilitating space weather effect, such as by including a safe mode;

(b) Incorporate space weather effects into satellite designs and mission planning for end-of-life disposal in order to ensure that the spacecraft either reach their intended graveyard orbit or de-orbit appropriately, in accordance with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space. This should include appropriate margin analysis.

17.6 International intergovernmental organizations should also promote such measures among their member States.

17.7 States should undertake an assessment of the risk and socioeconomic impacts of adverse space weather effects on the technological systems in their respective countries. The results from such studies should be published and made available to all States and used to inform decision-making relating to the long-term sustainability of outer space activities, particularly with regard to mitigating the adverse impacts of space weather on operational space systems.

C. International cooperation, capacity-building and awareness

Guidelines 25 and 26 provide guidance on international cooperation measures aimed at promoting the long-term sustainability of outer space activities for Governments and relevant international intergovernmental organizations authorizing or conducting space activities.

Guideline 25

Promote and support capacity-building

25.1 States and international intergovernmental organizations with experience in space activities should encourage and support capacity-building in developing countries with emerging space programmes, on a mutually acceptable basis, through measures such as improving their expertise and knowledge on spacecraft design, flight dynamics and orbits, performing joint orbital calculations and conjunction assessments, and providing access to appropriate precise orbital data and appropriate tools for monitoring of space objects through relevant arrangements as appropriate.

25.2 States and international intergovernmental organizations should support current capacity-building initiatives and promote new forms of regional and international cooperation and capacity-building that are in accordance with national and international law to assist countries in gathering human and financial resources and achieving efficient technical capabilities, standards, regulatory frameworks and

governance methods that support the long-term sustainability of outer space activities and sustainable development on Earth.

25.3 States and international intergovernmental organizations should coordinate their efforts in space-related capacity-building and data accessibility in order to ensure efficiency in the use of available resources and, to the extent that it is reasonable and relevant, avoid unnecessary duplication of functions and efforts, taking into account the needs and interests of developing countries. Capacity-building activities include education, training and sharing of appropriate experience, information, data, tools, and management methodologies and techniques, as well as the transfer of technology.

25.4 States and international intergovernmental organizations should also undertake efforts to make relevant space-based information and data accessible to countries affected by natural disasters or other catastrophes, guided by considerations of humanity, neutrality and impartiality, and to support capacity-building activities aimed at enabling the receiving countries to make optimal use of such data and information. These space-based data and information with appropriate spatial and temporal resolution should be freely, quickly and easily available for the countries in crisis.

Guideline 26

Raise awareness of space activities

26.1 States and international intergovernmental organizations should raise general public awareness of the important societal benefits of space activities and of the consequent importance of enhancing the long-term sustainability of outer space activities. To this end, States and international intergovernmental organizations should:

- (a) Promote institutional and public awareness of space activities and their applications for sustainable development, environmental monitoring and assessment, disaster management and emergency response;
- (b) Conduct outreach, capacity-building and education on regulations and established practices relevant to the long-term sustainability of space activities;
- (c) Promote activities of non-governmental entities that will enhance the long-term sustainability of outer space activities;
- (d) Raise awareness among relevant public institutions and non-governmental entities about national and international policies, legislation, regulations and best practices that are applicable to space activities.

26.2 States and international intergovernmental organizations should promote public awareness of space applications for sustainable development, environmental monitoring and assessment, disaster management and emergency response through information-sharing and joint efforts with public institutions and non-governmental entities, taking into account the needs of current and future generations. In designing space education programmes, States, international intergovernmental organizations and non-governmental entities should pay special attention to courses on enhancing knowledge and practice of the utilization of space applications to support sustainable development. States and international intergovernmental

organizations should initiate the voluntary collection of information on public awareness and education tools and programmes with a view to facilitating the development and implementation of other initiatives with similar objectives.

26.3 States and international intergovernmental organizations should foster outreach activities by or with industry, academia and other relevant non-governmental entities. Outreach, capacity-building and educational initiatives could take the form of seminars (in person or broadcast over the Internet), published guidelines to complement national and international regulations or a website with basic information on a regulatory framework and/or a contact point within the Government for regulatory information. Appropriately targeted outreach and education can assist all entities engaged in space activities in gaining a better appreciation and understanding of the nature of their obligations, in particular relating to implementation, which can lead to improved compliance with the existing regulatory framework and the practices currently being employed to enhance the long-term sustainability of outer space activities. This is particularly valuable where the regulatory framework has been changed or updated, resulting in new obligations for participants in space activities.

26.4 Cooperation between Governments and non-governmental entities should be encouraged and fostered. Non-governmental entities, including professional and industry associations and academic institutions, can play important roles in increasing international awareness of issues associated with space sustainability, as well as promoting practical measures to enhance space sustainability. Such measures could include adoption of the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space; compliance with the ITU Radio Regulations related to space services; and the development of open, transparent standards for the exchange of data necessary to avoid collisions, harmful radio frequency interference or other harmful events in outer space. Non-governmental entities can also play important roles in bringing stakeholders together to develop common approaches to certain aspects of space activities that can collectively enhance the long-term sustainability of space activities.

D. Scientific and technical research and development

Guidelines 27 and 28 provide guidance of a scientific and technical nature for Governments, international intergovernmental organizations, and national and international non-governmental entities that conduct space activities. They encompass, among other things, the collection, archiving, sharing and dissemination of information on space objects and space weather, and the use of standards for information exchange. These guidelines also address research into, and the development of, ways to support the sustainable use and exploration of outer space.

Guideline 27

Promote and support research on and the development of ways to support sustainable exploration and use of outer space

27.1 States and international intergovernmental organizations should promote and support research into and development of sustainable space technologies,

processes and services and other initiatives for the sustainable exploration and use of outer space, including celestial bodies.

27.2 In their conduct of space activities for the peaceful exploration and use of outer space, including celestial bodies, States and international intergovernmental organizations should take into account, with reference to the outcome document of the United Nations Conference on Sustainable Development (General Assembly resolution 66/288, annex), the social, economic and environmental dimensions of sustainable development on Earth.

27.3 States and international intergovernmental organizations should promote the development of technologies that minimize the environmental impact of manufacturing and launching space assets and that maximize the use of renewable resources and the reusability or repurposing of space assets to enhance the long-term sustainability of those activities.

27.4 States and international intergovernmental organizations should consider appropriate safety measures to protect the Earth and the space environment from harmful contamination, taking advantage of existing measures, practices and guidelines that may apply to those activities, and developing new measures as appropriate.

27.5 States and international intergovernmental organizations conducting research and development activities to support the sustainable exploration and use of outer space should also encourage the participation of developing countries in such activities.

Guideline 28

Investigate and consider new measures to manage the space debris population in the long term

28.1 States and international intergovernmental organizations should investigate the necessity and feasibility of possible new measures, including technological solutions, and consider implementation thereof, in order to address the evolution of and manage the space debris population in the long term. These new measures, together with existing ones, should be envisaged so as not to impose undue costs on the space programmes of emerging spacefaring nations.

28.2 States and international intergovernmental organizations should take measures at the national and international levels, including international cooperation and capacity-building, to increase compliance with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space.

28.3 Investigation of new measures could include, inter alia, methods for the extension of operational lifetime, novel techniques to prevent collision with and among debris and objects with no means of changing their trajectory, advanced measures for spacecraft passivation and post-mission disposal and designs to enhance the disintegration of space systems during uncontrolled atmospheric re-entry.

28.4 Such new measures aimed at ensuring the sustainability of space activities and involving either controlled or uncontrolled re-entries should not pose

an undue risk to people or property, including through environmental pollution caused by hazardous substances.

28.5 Policy and legal issues, such as ensuring that these new measures are compliant with the provisions of the Charter of the United Nations and applicable international law, may also need to be addressed.
