A NEW GOVERNANCE MODEL FOR A SAFE AND OPEN SPACE



GSC
GLOBAL SPACE COALITION

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Chairman's Foreword

By Anders Fogh Rasmussen

Space is a global commons and a strategic domain. But that premise of it being a global commons, shared by all, is under threat. Earth's orbits are not limitless, and they are filling faster than the rules designed to govern them were designed to address. The scramble to claim what remains is accelerating.

This is exactly why I convened the Global Space Council, a group of space leaders and experts who have produced this report. We are united to strengthen space governance because it is, at its core, an existential global resource.

Yet one could say that the space in space is shrinking.

The numbers speak for themselves. Only around 8,000 satellites were launched during the first sixty years of human space activity. More than 11,000 have been launched since 2020 alone.

And plans have been announced for millions more, including massive fleets of space data centres orbiting Earth. We are witnessing a galactic land grab, driven by a few racing to occupy orbits and lock up spectrum before anyone else can. SpaceX pioneered the mega-constellation model. Amazon and China, realising what that dominance means, are now racing to catch up.

Three challenges demand urgent attention.

First, scarce space resources are under siege. Space underpins modern society, from the navigation on your smartphone to the defence networks, to global connectivity and financial systems that keep economies functioning. As the most aggressive players rush to fill available space, they quietly foreclose options for smaller nations, emerging economies, and future generations. Left unchecked, access to space becomes contested and less secure for everyone.

Second, strategic dependencies are putting sovereignty at risk. When a few companies control most of the available strategic communications infrastructure and retain the discretion to switch it off, as seen in Ukraine, and bypass national controls entirely, they hold geopolitical leverage that no election conferred and no treaty constrains. Space-based assets have provided significant strategic advantages in recent military operations in Venezuela and Iran and are now a central component of governments' defence systems. The concentration of critical space infrastructure, both civil and military, in the hands of a few corporate and state actors is a structural threat to the independence of everyone else.

Third, international rules are outdated. The Outer Space Treaty and the International Telecommunication Union (ITU) frequency-coordination regime were built for a different era. Neither meaningfully addresses the weaponisation of space nor the accumulation of strategic chokepoints by private actors. Debris mitigation remains mostly voluntary. Spectrum coordination was designed to favour orderly access, but the rulebook is being actively rewritten, bent to benefit newer players and encourage hoarding rather than shared use. The vacuum is being filled not by multilateral consensus but by corporations and states that have concluded the existing rules will not stop them.

What is needed is a new framework that recognises the physical limits of the orbital environment, establishes enforceable rules for spectrum and orbits, and ensures access to space remains open to all.

Concretely, I would like to see the adoption of updated regulatory frameworks for market access at national level but crucially regionally too. Multilateral blocs such as the European Union, the Association of Southeast Asian Nations (ASEAN), the African Union should promote these, in full compliance with international law. We should also see United Nations frameworks updated to reflect the new reality and ensure the full participation of emerging space nations.

Moreover, a reform of ITU processes should be considered to enable equitable and timely access to spectrum and orbits for all nations and operators.

Ultimately, national governments and regional bodies must step up. They are the ones who can enforce binding rules. International agreements alone will not suffice.

The sky belongs to everyone. Keeping it that way will require rules with real teeth.

This foreword reflects the views of the Chairman and not of GSC members per se.



Executive Summary

- The space sector is undergoing rapid change, driven by technological advances, the growing role of new private actors, and the industrialization of satellite production and launch capabilities. This has led to a dramatic increase in satellite deployments, especially in Low Earth Orbit (LEO), and a surge in economic and strategic opportunities, but also to new risks and governance challenges.
- The proliferation of satellites in out-of-scale constellations, renewed interest in space exploration, and increased military activity in space have outpaced existing international and domestic frameworks. There is a pressing need to better quantify risks and for updated, binding rules and the means to ensure the safe, fair, and sustainable use of space by all nations, including rules addressing spectrum management, collision risk, and debris mitigation.
- The rise of dominant private actors like SpaceX and the intensification of geopolitical competition, especially between the United States and China, are reshaping the balance of power in space. This shift raises concerns about market dominance, unfair competition, and the ability of states to regulate and ensure their own equitable access to space resources and national sovereignty more generally.
- The exponential growth in satellite numbers has led to increased risks of radio-frequency interference, collisions, space debris, and environmental impacts to the Earth from launches and re-entries, as well as light pollution and adverse effects on critical astronomy functions. Current mitigation efforts are insufficient, and stricter national, regional, and international rules are urgently needed to preserve the sustainability of space activities for all nations.

Recommendations

- The report puts forward a series of actionable recommendations structured around five main pillars:
  - Design an equitable international space governance architecture representative of the interests of all nations and players.
  - Harmonize and coordinate Space Traffic mechanisms to prevent catastrophic situations related to congested orbital traffic and atmospheric re-entries.
  - Improve coordination against radio-frequency interferences and promote a fair and shared access to spectrum.
  - Incentivize industry to adopt sustainable-by-design practices by making market access contingent upon compliance with binding rules promoting a responsible use of outer space.
  - Urge the adoption of procedural and technical standards for improving end-of-life practices in orbit.



1 SETTING THE SCENE AND OUTLINING THE PROBLEMS

Space plays an increasingly critical role in our societies, with satellite systems supporting internet connectivity worldwide as well as critical government functions, from weather forecasts to crisis management and dual-use applications in navigation and intelligence. In recent years, the sector has undergone a profound transformation: by introducing new ways to mass-produce high-performance satellites and to reuse launchers, a reorganized space industry has transformed traditional space activity and the way our societies use space. The increased convergence of information and space technologies over the past decades has largely driven these structural changes, especially as new actors, sometimes outside the space community, have brought new knowledge, know-how, routines, and pace that have challenged the traditional way of building and operating space systems.

In this context, these new space perspectives have opened numerous economic opportunities. For example, they allow easier communications and improve agricultural processes, disaster planning and relief, bringing significant benefits for the implementation of public policies, including in the Global South. However, the current speed and scale of these changes also carry new risks and threats. Whether for traffic coordination in orbit, for fair access to the radio frequency spectrum, or even for industrial activities that may develop on the surface of the moon, a new space governance framework is required.

More generally, the preservation of a safe and sustainable use of space, accessible in the near future to all actors, both national and commercial, is being called into question by these new dynamics based on new forms of using and exploiting space. According to the results of a survey conducted in several countries for this report, there are major concerns about the protection and long-term sustainability of the space environment, with significant levels of awareness among young adults. For example, in both Canada and India, a 70% majority of respondents believe national governments should introduce new rules for private space activity.[1]

International frameworks and fora, such as the UN Committee on the Peaceful Uses of Outer Space (COPUOS) and the International Telecommunication Union (ITU), must adapt or possibly transform to face these rapidly emerging challenges in space and preserve the interest of all parties and communities. This can only derive from clear and widely shared objectives among the international community. The ultimate goal must be to agree on common, binding rules that will maintain space as an accessible, safe, fair, and sustainable environment while allowing us to tap into the benefits of the new space age.

A. Industrializing space: new perceptions and new figures

Space has, in recent years, attracted interest from an increasingly large number of players. Many countries have set up space agencies over the past ten years (such as Egypt, the Philippines, Senegal, and Myanmar most recently) or joined forces to form a regional body (as in the case of the African Space Agency). Considering national efforts alone, more than 90 countries have at least one satellite in orbit today.

In parallel, new commercial players have emerged with unprecedented power and are now considered full-fledged participants in international space activities. Driven by U.S. companies, these actors are betting on a new form of industrialization of space activity, essentially by emphasizing the standardization of processes and products. Current developments in Low-Earth Orbit (LEO), human exploration, and military-related activities are at the heart of this trend toward the industrialization of space.

A booming business in Low-Earth Orbit

LEO (160 km to roughly 2000 km from Earth) is the area of space activity that has undergone the most rapid and profound transformation over the past decade. Whereas some 8,000 satellites were launched during the first 60 years of human space activity (between 1957 and 2017), more than 11,000 have been launched since 2020. Today, there are approximately 14,000 satellites in LEO – ten times as many as 15 years ago. Some projections put the number of active satellites at 50,000 to 100,000 in 5 to 10 years.[2] This increased activity in LEO is linked, on the one hand, to technological advances and falling production and launch costs for satellites, and on the other hand, to the growing global demand for connectivity.

- *Technological transformations*

This trend reflects a transformation in technology that now makes it possible to occupy near-space on an industrial scale. The construction of small, low-cost satellites on an almost assembly-line basis, with performance levels adapted to Internet traffic, is the main reason for this new dynamic.

The introduction of partially or soon fully recoverable launchers is another transformative factor. A record 329 orbital launch attempts were made in 2025, up 25% on 2023, leaving the most active years of the Cold War far behind. More than 47% were made by SpaceX. Most of the satellites placed in LEO, and most of the rockets used to do it, belong to a single company, Starlink Services,[3] which has secured market dominance. Other players are trying to position themselves as competitors but remain smaller in scale, including Amazon LEO (formerly Kuiper constellation – 10 times smaller) and TeraWave (about 7 times smaller) by Blue Origin.

- *National/Regional projects for connectivity*

With 92 launches in 2025, China is a strong second after the United States (181 launch attempts) and displays an ambitious space programme based on fast-growing industrial

skills. China has planned the development of three constellations ranging from 12,000 to 13,000 satellites, and, in late 2025, it submitted two additional filings to ITU for non-geostationary networks, each possibly composed of 100,000 satellites.

Europe is following with the IRIS2 constellation established by the European Union in 2023. The development model is specific to Europe and remains primarily based on the objective of sovereignty in critical technologies and programs. The IRIS2 constellation primarily meets government needs for secure communications by 2030. With a few hundred satellites, the program is more modest in scale than the large existing (or projected) constellations, and its commercial viability will have to be proven.

- *Towards data centres in space?*

The next infrastructure frontier in LEO is orbital computing and space data centres, which are designed to move high-power AI computing and storage off-Earth to reduce terrestrial energy consumption and environmental impact. SpaceX's plan to deploy a system of up to 1 million satellites in disposable orbits around Earth would occupy all of LEO above their Starlink constellation. In practice, such a system would effectively blanket orbital shells, creating areas with elevated collision and interference risks and affecting the way lunar, planetary, and deep space missions are conducted. Without proper safeguards, space exploration in the coming decades would be at serious risk. While the actual deployment of this infrastructure is still years away, the geopolitical competition is already underway: the AI-enabled Three Body constellation is China's response to the US company plans. As for other space resources, the key issue will be concentrated control of critical capabilities – deployment, distribution, computing, capital – in and from space.

Enhanced human exploration, a new industrial El Dorado

This unprecedented level of activity in LEO is accompanied by a renewed interest in human exploration of the Moon and Mars, with particularly well-supported programmes in China, namely the International Lunar Research Station, and the U.S. with the Space Policy Directive-1 (SPD-1) and the Artemis programme.

- *The return to the Moon as a first decisive step*

This has resulted in significant funding over several years, with commercial actors playing a central role, especially in the United States. Artemis largely relies on the availability of two possibly competing "Human Landing Systems (HLS): SpaceX's heavy rocket "Starship," which would be transformed into a lunar lander for the crews, and the "Blue Moon" lander built by Blue Origin initially envisioned for Artemis-5. With China also investing heavily in this programme, envisioning the use of heavy-lift launchers and a possible landing of two Taikonauts on the surface of the Moon by 2030, two years later than the scheduled landing of a U.S. crew, the Moon is already the next stage of great power competition. The European Space Agency (ESA) contributes to the Artemis programme through the development of the European Service Modules to transport crew, as well as the proposed deployment of a satellite communication and navigation infrastructure under the Moonlight programme, intended to support the establishment of a sustainable lunar presence.

- *Logistics as the new space keyword*

The ambition to return to the Moon will generate intense logistical activity over the next few decades to build facilities on the surface (or in terrestrial and lunar orbits) and to ensure the transport of equipment and crews over time. These new programs are also expected to give rise to numerous logistical activities in cis-lunar space, contributing to increased orbital and launch activity and more intense pressure on limited space resources.

Beyond these state-sponsored programmes, the exploitation of "extra-terrestrial resources" is often mentioned as a possible incentive for the private sector to invest more in those activities, therefore helping develop and install a durable human presence beyond Earth orbit.[4] While such a perspective does not seem to offer any tangible prospects or viable economic activity for the immediate future, given the technical and economic challenges associated with the deployment of industrial-scale equipment needed for effective material exploitation and transportation, the mere suggestion of such possibilities may lead to a change in the roles of the various players in major exploration programs.

More generally, programs like Artemis or ILRS could profoundly transform global space activity, regardless of their orientation. Their implementation will require significant logistical resources and advances in the fields of propulsion, energy generation and management, as well as high levels of functional autonomy. To ensure their success and the delivery of broad benefits, extensive international discussions will be necessary to establish a binding framework for safe and sustainable operations.

A renewed military dynamic in and from space

In recent years, there has been a strong revival of interest in consolidating defence-related space activities. This trend marks a transformation in the military role of space, with satellites now much more directly usable in the operations themselves, with GPS-guided munitions as one of the most emblematic examples. More broadly, as demonstrated in Russia's war of aggression against Ukraine, the conduct of conventional operations has become highly dependent on the use of space systems. For example, the delivery of timely information from space systems, mostly commercial, has been crucial for Ukrainian military intelligence. In the same vein, the use of Starlink has provided a unique telecommunication/connectivity infrastructure for the conduct of military operations, while in parallel raising the issue of dependency on a single commercial provider for national critical services.

- *Military space-to-space operations*

Space has become a warfare domain, with malicious actors targeting space-based systems to create vulnerabilities in an adversary's defence architecture. European authorities have now formally acknowledged Russian attempts to conduct close-approach operations in orbit, which put satellites at risk.[5] In response to this trend, counter-space programs are being developed by spacefaring nations around the globe. Some 12 countries are now preparing various technologies capable of destroying space systems or disrupting their operation to varying degrees of severity.[6]

China, Russia, and the United States have the most advanced programmes, covering a wide range of possible actions: from reversible measures (such as jamming telecommunication payloads, blinding Earth Observation satellite sensors, or disturbing satellites using cyberattacks) to irreversible destruction (using ground-based Direct-Ascent anti-satellite missiles or co-orbital satellites colliding with/or exploding close to a space target) or degradation (using a space based directed energy weapon such as lasers, high-power microwave devices). India also demonstrated Direct Ascent-ASAT capabilities in 2019.

- *Reinforced military structures and budgets*

In parallel, over the past decade, several space nations have revamped their institutional organization (Russia, China) or even created new space forces or space commands (United States, France) that take into account this evolution and provide military forces with more latitude and efficiency to act in space. Germany has also announced the decision to dramatically develop its national space military capabilities in an unprecedented move to allocate 35 billion euros to military space activity by 2030.

As tensions in space have increased, preventing potential escalation has become a priority. Disabled satellites can become uncontrollable, increasing the risk of collisions with other spacecraft. Similarly, kinetic actions generate large amounts of space debris, which can be difficult to track and further compromise the safety and reliability of operators in nearby orbits. The establishment of measures to deter or discourage attacks represents a common objective for spacefaring nations.

B. What do these activities have in common? Logistics, norms, and governance

Need for a quantitative-based approach and new standards

The momentum observed in these three areas (LEO activity, human exploration, and military programmes) may prove decisive in shaping the future of the space environment. It will have enduring consequences in the development of key technologies, such as refuelling techniques or on-orbit servicing, innovative propulsion allowing greater flexibility in orbit, also involving the widespread use of AI and the generalization of edge computing-based architectures. Such technologies will be critical to managing large space infrastructure, whether commercial or military, with the latter domain largely benefiting from investments made elsewhere, notably in the commercial space sector.

These developments will require an approach that assesses the limits of the space environment and uses quantitative analysis to understand the long-term effects of new systems, both on the environment itself and on their capacity to coexist with existing and future space assets. This assessment should be the basis for effective standardization and normative policies, in turn clearing the way for a broader and sustainable industrialization of space. This shall be the case for

the development of LEO activities such as Space Traffic Management/Coordination (STM, STC), anti-collision techniques or interference mitigation measures, which are most needed in a context of ever-crowded orbits.

From state domain to public-private stewardship

Since the 2010s, the private sector has risen as part of the "New Space" movement. While New Space originated in the United States, other key spacefaring nations or groups of nations, such as China and Europe, have also been investing heavily in new industrial players able to provide high-end commercial services from space. These new industrial strategies do not stop at satellite applications. They also concern longer-term plans for human exploration of space based on a new relationship between governments and industry, spearheaded by the United States. Numerous private companies have also emerged in China in the launch and satellite sectors, with the country now ranking second worldwide in terms of space activity.[7] The emergence of private players remains within the control of the Chinese Communist Party and the Chinese leadership.

However, the increased involvement of the private sector in the design and use of future space systems does not mean the withdrawal of state authorities. In the satellite sector, the growing role played by space systems in major information networks has been attracting the interest of governments, which see in them new ways of meeting their own needs, particularly in the military sphere. Defence and intelligence communities can also capitalize on commercial multi-satellite space architectures to provide them with constantly refreshed images in near-real time.

The regulating role of states

In this context, industrial activity remains mostly supported by governmental budgets. Over the last 5 years, the manufacturing space industry received $50 to 60 billion in revenues per year from the sale of governmental systems, while only $10 to 15 billion came from the sale of commercial systems. Institutional launches represent an average of $2 to 3 billion per year in the U.S. and in China. [8]

SpaceX has, in recent years, emerged as a dominant player in the space domain. Its ability to concentrate the largest share of both governmental and commercial/private launch activity worldwide, as well as the unique position of Starlink in cumulating more than 70% of the active satellites in orbit, is unprecedented. These developments have opened scenarios where commercial dominance competes with national sovereignty, not only over military capabilities but also over civil space-based technologies that our societies depend on.

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TOWARDS EFFECTIVE AND SUSTAINABLE SPACE GOVERNANCE

The consequences of increased private activity in space have raised attention at the intergovernmental level. In this regard, the UN COPUOS just took a major step in establishing an expert group on Space Situational Awareness. More generally, COPUOS's work to ensure the long-term sustainability of space (LTS guidelines) must be continued, and its political support broadened. In parallel, given the pace and scale of the challenges, faster action at the national and regional levels should be encouraged to ensure responsible behaviour through market access rules.

For more than a decade, the notion of responsible use of space has been largely debated, leading to the adoption of the "Guidelines for the Long-term Sustainability of Outer Space" published in July 2017. Grouped into four categories, these guidelines have been intended to address the policy and regulation framework, the safety of space operations, international cooperation, capacity-building, awareness, and scientific and technical research and development. However, while 21 Guidelines have been adopted, 7 did not reach consensus during the mandate of the working group,[9] demonstrating difficulties in obtaining some level of political agreement on practical measures beyond statements of principle.

Some other multilateral forums have worked on addressing issues such as the proliferation of debris in outer space. A notable effort has been led by the European Space Agency (ESA) to set up a "Zero Debris Charter" involving debris-neutral space activities by 2030. This Charter has been supported by a dozen countries.[10] However, the list does not include the most prominent and active spacefaring nations. Furthermore, the Charter constitutes a non-binding measure, which significantly limits the actual policy impact it will have.

Additionally, mounting tensions in space between China, Russia, and the United States have prevented any agreement on the principles of collective security in orbit. For example, numerous strategic differences both in the form and the content of possible future international agreements have regularly blocked discussions on the subject in Geneva under the auspices of the UN Disarmament Conference.

The following areas should be the object of renewed discussions with the aim of updating local and global governance frameworks.

A. Preservation of the orbital environment

Satellites today are critical for our societies' prosperity and resilience. It is important to keep the shared orbital environment safe and secure to support the pursuit and development of national missions across the globe and for future generations.

The uncontrolled deployment of ever-larger satellite constellations infringes on the general interest by overcrowding orbits. It is therefore essential to make the future of the orbital environment the subject of a broader and renewed international discussion in which emerging actors can have adequate room to express their views and needs, as well as to access space and its

resources. Ultimately, governments should be able to monitor and enforce the implementation of responsible behaviours by all players against various risks.

Inter-satellite collision risks

The first collision between two satellites in orbit occurred on 10 February 2009, between a U.S. Iridium satellite and a Russian Cosmos satellite. This event raised awareness worldwide about the need for better orbital management to prevent catastrophic events.

Since the late 2010s, the emergence of large constellations composed of thousands of satellites spread across several altitudes, especially in orbits ranging from 450 km to 600 km, has made such collision risk more frequent. As the satellite population in LEO is expected to increase five-to-sixfold by 2035, these risks are predicted to increase too. The sharing of similar-altitude orbits will be heavily impacted, as will the safe movement of satellites during the Launch and Early Orbit Phase (LEOP). In this context, ensuring the sustainable development of space activities in LEO will require not only updated satellite catalogues but also careful operational practices and operator-specific risk mitigation strategies.

The challenge of adapting to increasingly dense orbital traffic

The space environment has undergone a dramatic transformation, as illustrated by recent figures published by SpaceX. In the six months up to the end of May 2025, some 144,404 conjunction risk mitigation maneuvers have been performed by Starlink satellites. This has represented an average of 37 maneuvers per Gen 1 satellite per year, and an average of 44 maneuvers per Gen 2 satellite per year, according to SpaceX's first semi-annual report to the FCC of spring 2025.[11] As a whole, this figure represents an increase of about 200% from the previous six months.

Voluntary measures can only complement, but not replace, binding Space Traffic Management measures. In the longer term, relevant governance rules to control the risk of satellite collisions in orbit will also have to be worked out. Improved communication practices between the different states and/or operators will be central to effective management of collision risks. In 2019, ESA had to manoeuvre its satellite after a 1 in 1,000 collision risk with a Starlink craft. This episode highlights the need for better communication between operators, but also for more effective rules to prevent incidents. It must be noted that initial communication efforts took place in late September 2025 when the China National Space Agency (CNSA) contacted NASA about a potential in-orbit collision with a proposed coordinated action. Several efforts stemming from China's constellation operators to initiate early talks with their U.S. counterparts have also been noticed recently, according to U.S. sources.[12] Such coordinated procedures will contribute to making space activities safer.

Proliferation of debris

It is estimated that more than 100 million debris objects have been orbiting the Earth, which have already resulted in several hundred events generating further in-orbit debris. Historically, debris comes from inactive satellites, used rocket stages, explosion remnants, and even fragments from past anti-satellite weapons tests. While some 54,000 objects larger than 10 cm are currently tracked by the U.S. Space Surveillance Network, more than 1,200,000 objects less than 1 cm, and more than 130,000,000 larger than 1 mm, have been orbiting the Earth[13] but cannot be tracked. This situation presents many risks, as even the smallest debris speeding at 8 km/s can cause irreparable harm to satellites and rapidly create chain reactions that ultimately make LEO unusable, as described by the Kessler Syndrome. As the density of satellites in orbit increases, along with their mass and size, the risks of collision with debris are also getting higher.

According to several studies, entities originating from the United States, Russia, and China are responsible for 96% of orbital debris (with each nation contributing about a third of the total),[14] mostly due to accidental fragmentations in space. This danger has regularly increased over recent years. Since 2018, the launch traffic to LEO has multiplied by 3 and is responsible for the largest part of the debris re-entry problem. This has led operators and agencies to adopt new procedures, mostly by multiplying preemptive debris avoidance maneuvers in LEO. For example, on 30 April 2025, the International Space Station performed its 41st maneuver to avoid orbital debris from a fragment of a Chinese Long March rocket launched in 2005.[15]

Impact on human spaceflight activities

Debris multiplication has an impact on human spaceflight activities by elevating the risk during critical phases such as orbital rendezvous, docking, and extravehicular activities (EVAs). In several cases, crews may be forced to shelter in emergency return vehicles (Soyuz, Crew Dragon, Shenzhou)[16] . Space stations also present specific vulnerabilities due to their large size with a permanent crew on board. Among risks, an impact generated by space debris could render a module uninhabitable, force an emergency evacuation, or even lead to the total loss of the station. Future plans for private space stations will have to balance such risks, the probability of which will increase over the next few years.

More prospectively, future human crewed lunar missions will have to pass through congested LEO regions. Even a minor impact could compromise the spacecraft's structural integrity or damage the propulsion system, rendering a safe return of the crew impossible.

Existing approaches to remediation

The net increase in orbital debris remains the most significant threat to the future sustainability of space activities. According to the most recent NASA simulations, the best-case scenario looks rather gloomy. Considering an interruption of all space launches starting from 1 January 2026 as a starting hypothesis, this scenario envisions, in the first place, a replacement of decaying debris by newly generated debris, “keeping the total population approximately constant. Beyond 2055, the natural decay of orbital debris slows down, reducing the rate at which objects are removed from

orbit. Consequently, collisions between existing objects become the dominant driver of new debris generation, leading to a net increase in the overall satellite and debris population." [17]

Many states and operators have put in place practices for the mitigation of fragmentations in orbit or the adoption of post-mission deorbiting rules, as promoted by the Inter-Agency Space Debris Coordination Committee (IADC) most notably. An ESA report released in October 2025 [18] provides some positive news in this respect:

> "A major event visible in this edition of the report is the de-orbiting of a telecommunication constellation in Low Earth Orbit which started in 2018. Just as the insertion of this constellation is visible in the launch traffic increase, it now stands out as an increase in successful post mission de-orbiting when it comes to compliance to the guidelines. Furthermore, with the coming into operations of a newer generation of launchers, the release of mission related objects as part of their operations is going down." [19]

However, the study also concludes that "*current levels of compliance to space debris mitigation guidelines at large are insufficient for achieving a sustainable space environment long-term, and there is a growing consensus that stricter mitigation practices need to be implemented globally.*" [20]

Similarly, according to ESA, "*the results from the evaluation of the scenario indicated that even when spaceflight is completely halted today, the amount of space debris objects in Low Earth Orbit is likely to increase. The extrapolation of our current behaviour, which assumes the continuation of explosion in orbits at current rates, adherence by constellations to at least the minimum desirable post-mission disposal success rates, and continuation of the currently estimated post-mission disposal success rates for all other objects, leads to an unstable environment with collision rates increasing exponentially. While a shift in launch traffic to orbits with low orbital decay [...] improves the situation, the implementation of all space debris mitigation strategies are necessary to avoid an adverse future.*" [21]



Protecting Earth's environment and the night sky

The multiplication of space objects also has a greater impact on Earth's environment, more specifically on the atmosphere. The intensification of launch and re-entry rates may raise the level of atmospheric pollution in specific layers of the upper atmosphere.

Emerging research indicates that rocket emissions, particularly black carbon and alumina, may harm the ozone layer and increase stratospheric warming.[22] The related impact of burnt material, such as Aluminium Oxide (AL^2O^3) or other particles, on the ozone layer needs to be better characterized and may justify anticipated protective measures.

Additionally, the largest space debris re-enters the Earth's atmosphere daily.[23] Damage can occur as they hit the surface of the Earth. For example, between February and October 2025 alone, at least six pieces of debris (mainly coming from reentering Rocket stages) have fallen back to Earth, one of those having impacted a village in Poland and caused property damage. Such debris can also create dangerous situations for air traffic and flight safety, compelling authorities to take appropriate protective measures. These measures have, of course, immediate economic consequences, which could even augment with dramatically enlarged space launch activities. In March 2025, the U.S. Federal Aviation Authority (FAA) reported that 240 flights were disrupted due to one failed launch.[24]

In this context, a global transition toward green propulsion, launch recovery systems, and multilateral tracking of emissions and re-entry activity have become issues to be tackled in relevant international forums.

Astronomy and the natural night sky are also increasingly affected by the proliferation of space objects. Large numbers of satellites reflect sunlight and create bright streaks in long-exposure telescope images, which can compromise astronomical observations. Their radio transmissions can also interfere with sensitive radio telescopes, potentially masking faint cosmic signals. At the same time, the growing number of satellites visible shortly after sunset and before sunrise is altering the appearance of the night sky, raising concerns among scientists and organisations like the International Astronomical Union about the loss of pristine dark skies. In general, more consideration should be given to the nature of spectrum as a limited natural resource and the implications this has for the management of frequencies.

B. Spectrum management issues

Situations are already occurring where large constellations try to operate above the internationally recognised power levels, designed to allow LEO satellites to operate alongside Geosynchronous Orbit (GSO) satellites in the same spectrum band. Such operations risk interference with the signals used by defence and security systems.

The development of satellite constellations for the purpose of improving general access to connectivity and telecommunications worldwide, while legitimate, should give real consideration to the orbital overpopulation and, more generally, to the importance of adopting a sustainable strategy for the development of space capabilities.

The role of the International Telecommunications Union (ITU)

In this context, possible contradictions may need to be reconciled with the necessary development of new frameworks for using space in a sustainable way in the field of LEO communication and connectivity satellites. In this regard, the ITU retains a major role in managing the coexistence of satellite constellations, both in orbit (with projects that sometimes do not even have manoeuvring capabilities) and in the radio frequency domain for avoiding undue interferences.

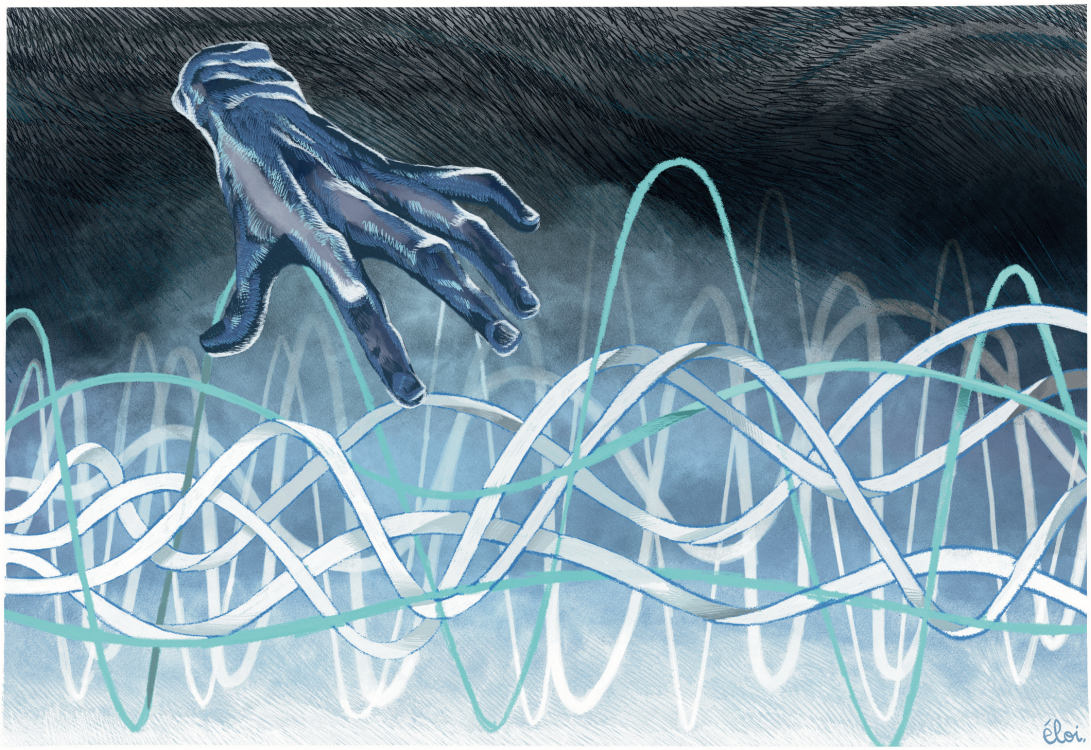
The foundational principle of equitable access to outer space, as enshrined in the Outer Space Treaty, is widely supported by the international community and by emerging space nations. However, the growing dominance of large commercial constellations in LEO poses structural challenges, particularly in relation to the management of radio frequency interferences and spectrum sharing. Any future reforms should ensure a fair playing field between incumbents and newcomers, as well as the sustainable coexistence of different satellite systems in different orbits. The push by some actors to relax the Equivalent Power-Flux Density (EPFD) limits, which determine how Non-Geostationary (NGSO) satellites operate to avoid interfering with established Geostationary (GSO) satellites, risks disrupting and degrading critical services provided by the latter, ultimately leaving governments and citizens who rely on them worse off.

The existing governance system, particularly as administered through the ITU, remains based on the "first-come, first-served" principle. This approach has proven to have practical benefits, namely simplicity and predictability, which have provided a stable administrative structure allowing operators to plan, invest, and innovate with confidence. It has been noted that "the first-come-first-served approach only applies for the identification of the satellite networks with which a newcomer has to discuss/coordinate" and that "no administration obtains any particular authority as a result of being the first to start a procedure".[25] In general, more consideration should be given to the nature of spectrum as a limited natural resource and the implications this has for the management of frequencies.

Earlier attempts to replace this "first-come, first-served" approach with widely accepted notions, such as those stated in Article 1 of the 1967 Outer Space Treaty[26], did not manage to establish clear mechanisms for allocation, enforcement, and benefit-sharing, leaving unresolved how authority would be exercised, how compliance would be verified, and how incentives for private and national participation would be preserved. The recent rush for orbital slots and frequency allocations (mainly due to the rise of connectivity satellite constellations) may only complicate this global picture and exacerbate the feeling of exclusion and unfairness from a part of the international community. New ways forward are needed. Forward-looking national governments around the world must take the lead towards an updated framework that reflects today's realities.

Voices for reforms

The recently created African Space Agency (AfSA) is intending to work cohesively with the African Telecommunications Union (ATU) to advocate for reforms to the ITU regulatory framework to safeguard Africa's long-term access to orbital slots and spectrum. Resolution 559 (WRC-19), which ensured guaranteed access to orbital rights for 31 African states, exemplifies progress, but implementation hurdles persist (ITU, 2023). For example, many African states struggle with the 7-year ITU deadline to operationalize filings, necessitating more flexible coordination and capacity-building support (ATU, 2024). Also, to prevent orbital monopolization and spectrum crowding, African states are seeking to support establishing transparent deployment thresholds, equitable filing procedures, and public notification systems. For these actors, regulatory innovation should prioritize access for emerging nations and reflect geographic diversity in spectrum use.



Fair commercial competition

Hugely dominant commercial positions create the risk of unfair competition, with best practices and governance in space being set by the most powerful players. While some spacefaring nations or companies may legitimately retain a leading role in the use of space, it is important to ensure that safeguards are applied in accordance with the existing space law and the texts governing multilateral organizations. This includes the ITU constitution or the Preamble of the Radio Regulations (see extract below).

Extract, Radio Regulations, Articles, Edition of 2024, ITU, p.3

(...) Preamble 0.3 *In using frequency bands for radio services, Members shall bear in mind that radiofrequencies and any associated orbits, including the geostationary-satellite orbit are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of these Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries (No. 196 of the Constitution). (...)*

Therefore, it is more important than ever to recall the responsibility of states in ensuring the collective safety and security in space as well as their role as regulators for space activities, which are changing in scale and require more intensive international cooperation in existing or ad-hoc multilateral forums. Governments should not abdicate their norm-setting role. If an international consensus cannot be found, regional or national market access rules should be the starting point.

C. Towards a creeping "territorialisation" of space?

The 1967 Outer Space Treaty, the main international text governing the use of space, affirms the principle of non-appropriation of space. However, the intensification of space activities, whether today in Earth's orbit or tomorrow on the surface of the Moon, may put this principle into question and already stirs debates between lawyers regarding its relevance.

The increase in military activities in orbit and the growing number of experiments involving satellite approaches and anti-satellite tests have led the major spacefaring nations to develop defensive space programs aimed at protecting satellites. Such defensive countermeasures are now often mentioned in the few doctrinal texts that exist.

"Active Defence" for protecting satellites

The French "Space Defence Strategy" published in 2019 evokes the notion of "active defence" that would consist of making sure that French military satellites would be protected in case of a "hostile" satellite rapprochement. In this context, the YODA programme has been launched: it will consist of some sort of experimental "sentinel" or "guardian" satellites able to identify possible rapprochements and prepare for response actions. In the same vein, other military doctrines would mention in this case the notion of "defensive counter space programmes" (deemed different from "Offensive Counterspace programmes").

More generally, as shown in the Global Counterspace Capabilities report produced annually by the Secure World Foundation, with experiments aiming at perfecting manoeuvres to possibly attack satellites on the rise, investments in such defensive capabilities tend to increase. With this increased military tension in orbit over the recent years, and the emergence of possible hostile Rendez-vous and Proximity Operations (RPOs), the notion of defensive zones around satellites de facto creates new "territories" in space, with acknowledged "borders", or "no flight zones". As a result, the growing tension between countries in space could lead to a new form of "territorialisation", laying the foundations for a new spatial geography that is currently impossible in theory.

3

RECOMMENDATIONS TO STRENGTHEN MARKET RESILIENCE THROUGH A MORE SUSTAINABLE USE OF SPACE

Based on the findings highlighted in this study, five pillars for a safer and more sustainable use of space can be identified and serve as the foundation for strong recommendations.

Pillar 1 → Design an equitable international space governance architecture representative of the interests of all nations and players

Pillar 2 → Harmonize and coordinate Space Traffic mechanisms to prevent catastrophic situations related to congested orbital traffic and atmospheric re-entries

Pillar 3 → Improve coordination against radio-frequency interferences and promote a fair and shared access to spectrum

Pillar 4 → Incentivize industry to adopt sustainable-by-design practices by making market access contingent upon compliance with binding rules promoting a responsible use of outer space

Pillar 5 → Urge the adoption of procedural and technical standards for improving end-of-life practices in orbit

These priorities point to necessary steps to be taken at the national, regional, and international levels to address current regulatory, industrial, and environmental challenges. They are also meant to address short to mid-term actionable operational procedures, helping operators develop their activities in a safe and sustainable environment. Ultimately, political resolve from governments will be necessary to take meaningful action to protect their sovereignty and one of humanity's crucial global commons.

Pillar #1

Design an equitable international space governance architecture representative of the interests of all nations and players

OBJECTIVES:

The lack of global consensus in multilateral fora and the resulting failure to update rules written for a different era are the key challenges to global space governance. In this vacuum, political decisions made by companies (and national governments backing them) have more and more profound geopolitical implications, at times with negative operational impacts. This report calls for improving, and if necessary, reforming key multilateral mechanisms that have so far been too slow to act. In parallel, given the urgency of the situation and given that some nations and groups of nations are very well aware of the risks, regional initiatives should be incentivised. They would not undermine the global architecture but rather serve as a pull factor towards more ambitious global frameworks.

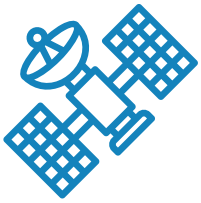
RECOMMENDATIONS

Recommendation #1.1.

- **Starting point**: Recent years have seen a significant increase and growing diversification in the nations and players involved in space activities. New commercial industry, as well as the multiplication of national space projects, has spurred new debates at different levels and in diverse forums. This evolution is a welcome testimony to the vitality of space activity. While bilateral frameworks such as the Artemis Accords and China's ILRS initiative are expanding, they must be harmonized with the multilateral framework of the Outer Space Treaty (AU, 2025).

- **Proposed way forward:** To foster international cooperation, UNCOPUOS will remain central, and responsibility under Article VI of the Outer Space Treaty must be upheld, particularly as commercial and military activity proliferates. However, these frameworks need to be updated to reflect the new reality and ensure the full participation of emerging space nations. A "coalition of the willing" approach can be foreseen to avoid space governance becoming hostage to geopolitical rivalries.

Recommendation #1.2.



- **Starting point**: The unprecedented multiplication of satellites orbiting the Earth has fundamentally transformed the space environment for all actors, both public and private. New constraints and new responsibilities have emerged that require more complete and more demanding communication between space actors.

- **Proposed way forward**: Expand transparency and compliance at all levels, involving universal satellite registration, notification of orbital maneuvers, and independent audits of compliance with debris mitigation and safety standards. Empowered national and regional authorities would be able to provide the strongest level of compliance. Countries such as Japan, Canada, India, Brazil, South Africa, as well as the European Union, where significant emphasis is placed on oversight and sustainability, should lead the way.

Recommendation #1.3.

- **Starting point**: More than 20 space nations have adopted national regulatory frameworks to address mounting commercial space activity. This commitment to safer and more responsible space activities must underpin the industrialization of space.

- **Proposed way forward**: The adoption of updated regulatory frameworks for market access at the national and regional levels (e.g., the European Union, ASEAN, the African Union) should be promoted[27], in full compliance with international law but going further where more ambition is required to protect space resources and fair competition. International dialogue among policymakers and regulators should particularly emphasize aspects related to safeguarding national sovereignty and ensuring security in space activities.

Recommendation #1.4.

- **Starting point**: Many large space projects, ongoing or planned, may have direct adverse effects on the environment, whether in space or on Earth. Precursor, but incomplete studies have tried to characterize the impact of multiple reentering space debris or high-frequency space launches on the atmosphere.



- **Proposed way forward**: Promote efforts to translate principles adapted from international environmental law – such as the precautionary principle, protected areas, carrying capacity, restoration obligations, and polluter-pays – into orbital governance. Existing supervisory techniques for compliance, such as Monitoring, Reporting and Verification (MRV), should also be introduced.

Pillar #2

Harmonize and coordinate Space Traffic mechanisms to prevent catastrophic situations related to congested orbital traffic and atmospheric re-entries

OBJECTIVES:

The development of common standard procedures in orbit and for atmospheric re-entry must be prioritized to allow for deconfliction between satellites' respective trajectories and management. This report calls for maximizing the harmonization of national policies and increasing data and information sharing in this domain.

RECOMMENDATIONS

Recommendation #2.1.

- **Starting point**: Recent decisions made by operators to improve their anti-collision processes are an indication that some orbits are getting crowded and will necessitate better and more refined coordination. In this context, legislative and technical frameworks are being proposed for improved and more inclusive coordination.

- **Proposed way forward**: Strengthen the coordinating effort of space traffic management (STM) mechanisms and increase transparency through the establishment of public registries recording orbital data and end-of-life performance. These exercises should include the impacts of future scenarios involving an even more extended industrialization of space (e.g., the deployment of next-generation satellites in existing constellations, the deployment of space data centers), which should in turn inform the regulatory approach for allowing operators to provide services in each market.

Recommendation #2.2.

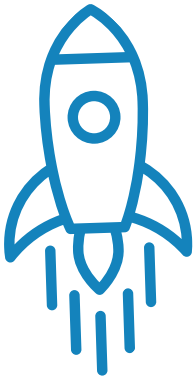
- **Starting point**: At certain altitudes, space has become more congested, creating more risks of mutual damage based on late communication or insufficient transparency measures. Focusing on LEO, the diversification of satellite operators, involving many new commercial players, requires better organized data-sharing practices at the technical level.

- **Proposal and way forward**: Encourage an international transparency compact under ITU-R or COPUOS for consistent, machine-readable publication of deployment and deorbit data, and explore a standing coordination forum for technical data exchange – similar in spirit to the International GNSS Committee. Near real-time ephemerides and maneuver data should be shared using networks of regional/national data centers. This would require the publication of machine-readable ephemerides and maneuver notices, along with the designation of a 24/7 point of contact for conjunction response. Data sharing between and among national SSA systems should become routine.

Recommendation #2.3.

- **Starting point**: Given the huge number of LEO satellites already deployed or to be deployed in the near future, and considering their evolving size, mass, and design, increasing attention is being paid to their re-entry phase.

- **Proposed way forward**: States should agree on a mandatory requirement for operators to incorporate "Design for Demise" mechanisms in their systems before allowing satellite launches in order to minimize the risks during atmospheric re-entry, either for air traffic or on the ground.



Pillar #3

Improve coordination against radio-frequency interferences and promote a fair and shared access to spectrum

OBJECTIVES:

In a context of ever-more crowded orbits, radio-frequency interference will become a major problem. Before we reach the critical point, it will be necessary to define principles allowing equitable access to and use of frequency bands. This scarce resource is becoming rare, and operators, notably those in charge of NGSO (i.e., large connectivity LEO satellite constellations), will have to adopt balanced and reasoned policies for long-term sustainable use.

RECOMMENDATIONS

Recommendation #3.1.

- **Starting point**: In the context of the accelerated deployment of LEO constellations, more proactive "first-come, first-served" strategies to file new systems at the ITU level have been applied. This creates an imbalance between countries and operators in their ability to develop and deploy new systems.

- **Proposed way forward**: A reform of ITU processes should be considered to enable equitable and timely access to spectrum and orbits for all nations and operators, covering current and future systems.



Recommendation #3.2.

- **Starting point**: New space-based connectivity services may have a disruptive effect on current national telecommunication architectures that are meant to support the general public interest.

- **Proposed way forward**: States should design a regulatory environment tailored to space-based communication services, applicable across national, regional, and international levels, by prioritizing accessibility, cost-effectiveness, and resilience, and by recognizing the relationship between space services and terrestrial networks, avoiding market distortions. The fair coexistence between different satellite systems should be central.

Recommendation #3.3.

- **Starting point**: The rapidly changing space environment may create some degree of uncertainty regarding the technical assumptions used to process the NGSO filings.

- **Proposed way forward**: The introduction of new requirements in NGSO processing rounds, calling for the adoption of common simulation assumptions and requiring open, auditable interference-avoidance methods, should be promoted.



Recommendation #3.4.

- **Starting point**: With the increase in LEO activity, dominant players may put strategies in place that enable them to exert undue control on the use of spectrum resources.

- **Proposed way forward**: Reforms within the ITU should be put in place to prevent spectrum warehousing and allow periodic review of under-deployed filings.

Pillar #4

Incentivize industry to adopt sustainable-by-design practices by making market access contingent upon compliance with binding rules promoting a responsible use of outer space

OBJECTIVES:

In the context of a rapidly developing private space activity, a balance must be found between including industry in the design of space safety and sustainability measures and reaffirming states' norm-setting power in pursuit of the common good. With the pace of technological advances, one of the key problems with regulatory measures is to maintain their relevance and stability over time. For this reason, states must anticipate and set up a general framework capable of aligning industrial strategies and public-interest regulations.

RECOMMENDATIONS

Recommendation #4.1.



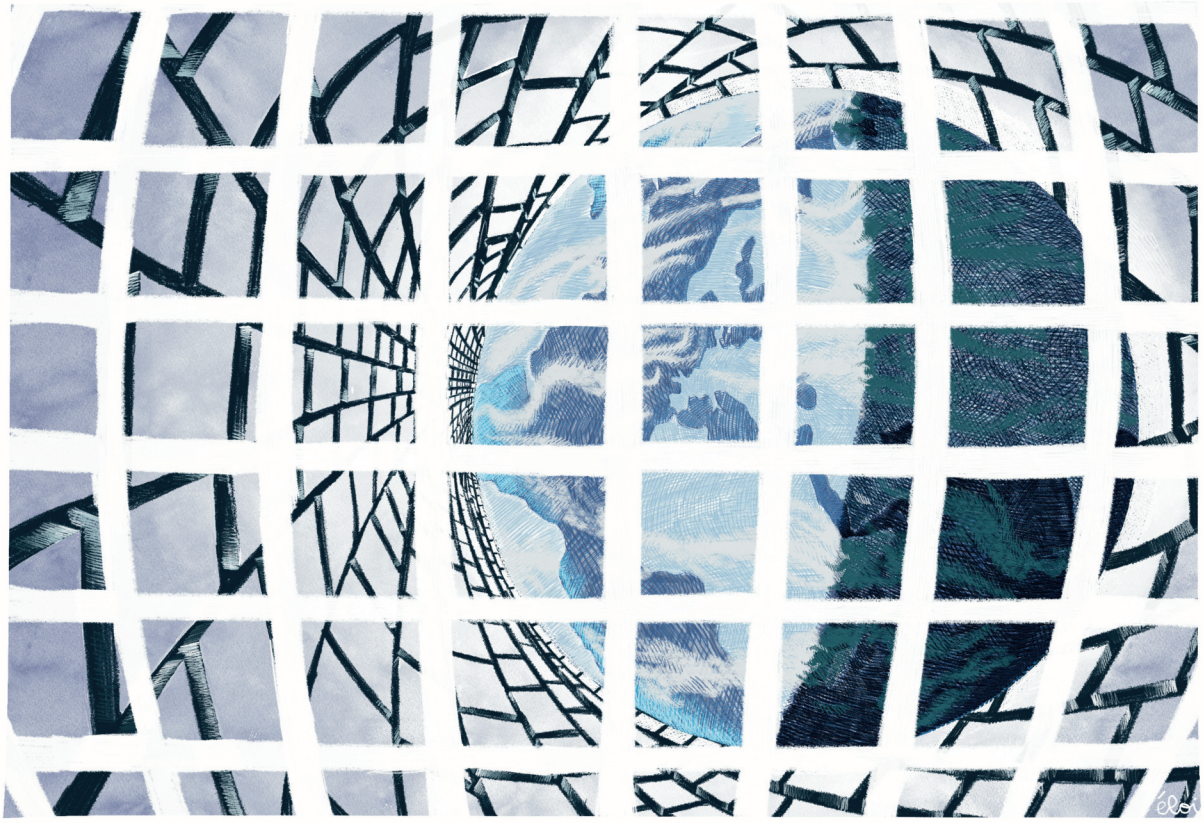
- **Starting point:** Industry has become a key player in the development, operation, and use of space systems and has a major role in shaping the space environment.

- **Proposed way forward:** Governments should establish a system of performance-based credits that rewards demonstrably safe designs – such as low casualty risk or autonomous collision-avoidance capability – with faster processing or lower fees. While monitoring and enforcement would be carried out by national authorities as they determine market access and authorization, coordination among like-minded regions is key in designing a system allowing all players to maximise the benefits of space operations across borders, with global adoption as the ultimate goal.

Recommendation #4.2.

- **Starting point**: Industry will have an increasing role in populating Earth's orbits with satellites and shall be asked to abide by best practices when deploying out-of-scale constellations. There are currently no direct government incentives for the space industry to reap the rewards of virtuous behaviour, and transparency remains limited when it comes to assessing current industrial practices in space beyond self-produced data or reporting.

- **Proposed way forward**: Deployment authorizations for satellite constellations should be conditional upon the adoption of a phased approach, with verification of end-of-life success rates before authorizing subsequent phases. Operators should also be required to publish compliance reports for each system on a regular basis. Additionally, governments should offer regulatory sandboxes, expedited permits, and procurement preferences for companies demonstrating low-debris designs, active debris removal (ADR) technologies, or open-data environmental services.



Pillar #5

Urge the adoption of procedural and technical standards for improving end-of-life practices in orbit

OBJECTIVES:

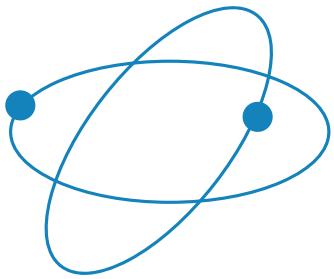
This report aims to minimize the harmful effects that would derive from poor regulation at a time when tens of thousands of satellites will be launched in the next 10 years. Some measures can be taken to limit the risk that increased activity worsens the situation.

RECOMMENDATIONS

Recommendation #5.1.

- **Starting point**: Some zones are more sensitive than others to possibly uncontrolled orbital developments. To address this potential development, the IADC Space Debris Mitigation Guidelines, as well as the UN COPUOS Guidelines for the Long-Term Sustainability of Space Activities, have promoted the concept of "Protected regions" (e.g., critical altitudes for scientific missions, debris-sensitive zones).

- **Proposed way forward**: This concept should be implemented, along with cap congestion metrics for launches and large constellations, and remediation plans and financial guarantees for restoration or removal. This would call for setting orbital occupancy quotas by altitude layer, preventing overcrowding of specific shells.



Recommendation #5.2.

- **Starting point**: Too many satellites are not disposed of in due time, threatening the active satellite populations with possible collisions.

- **Proposed way forward**: Governments should agree on a complete application of ISO 24113 2023 standards and on the guidelines of the IADC for design, passivation, and end-of-life disposal. The objective is to limit the post-mission lifetime of satellites in LEO as soon as possible, and to a maximum of 5 years after the end of operations, with at least 95% probability of successful deorbiting, consolidating current trends applied by space agencies and operators.

Recommendation #5.3.

- **Starting point**: A growing number of operators have proposed deploying very large satellite constellations, up to several tens of thousands of satellites each. As collision risk increases with increased mass and width of space objects, this will mechanically increase the risks of potentially devastating accidents and calls for reinforced mitigation measures.

- **Proposed way forward**: Governments should require redundant disposal systems for any constellation exceeding 1,000 satellites. Propulsive maneuverability should also be mandatory above certain operational altitudes. More generally, governments should agree on regular updates of the existing licensing requirements to keep pace with the rapid increase in the number of satellites in orbit and ensure realistic collision and casualty-risk limits, validate end-of-life plans with bounded deorbit timelines, and require mandatory reporting of anomalies or loss-of-control events. Ultimately, the safest solution would be an ex-ante approach, for example rules on the design of satellites that limit their mass, to significantly reduce the risks in the first place.

4

CONCLUSIONS AND WAY FORWARD

The issues identified in the report have been traditionally addressed in a disaggregated fashion among different institutions and at different levels. The dual nature of space activities has complicated the picture, with sometimes separate interests and/or practices among the different stakeholders. As space infrastructure becomes increasingly versatile, the situation is becoming more blurred than ever, and new challenges have emerged on the way towards a safer and more sustainable space environment. The rapid evolution of future military space infrastructures, such as the one envisioned by President Trump for the U.S. Golden Dome, will undoubtedly have a profound impact on the entire space ecosystem and on how space will be accessed and used by all.

Finding the right balance

We are witnessing a complete redefinition of how humanity occupies space, which means revisiting rules that have not changed for several decades. Achieving this objective is not easy. Whether it is a question of defining new rules for coexistence in orbit or on celestial bodies, or of sharing resources (orbital, frequency, or potential natural resources) more effectively without hindering the current growth of the space economy and promoting sustainable and controlled space development practices, the space community needs to find a new balance.

It is necessary to fight against a general trend towards the fragmentation of interests and practices and propose instead a more coherent framework that will help address these challenges.

Adhering to the fundamental principles

With this objective in mind, this report acknowledges the existence of a few basic principles forming the conditions for a safer and more sustainable space.

Most space countries advocate for adherence to the principles enunciated in the 1967 Outer Space Treaty. Different institutions from different parts of the world agree on those core principles, such as equitable access to space or non-appropriation of space. UN institutions remain central to favor a more balanced role of all nations in collective decisions, with an emphasis on the newly emerging space countries. The central role of the UN in its different components (UNGA, UNOOSA, COPUOS, CD, ITU, notably) in promoting stability as well as the preservation of collective interest in space is largely acknowledged.[28]

However, the role of the UN specialized bodies needs to adapt to the accelerated pace of the activities of commercial space companies in order to work out a relevant framework that preserves neutrality for these activities for the benefit of all nations, whether for promoting the exploitation of extra-terrestrial resources or for fair use of orbits and frequencies. Action at the national and regional levels is also necessary to provide new input to these fora and complement the framework with binding regulations that benefit the whole space community.

Transparency and compliance condition mutual trust. Mutual trust forms the basis for any actionable collective sustainability in space. Reference to Article VI of the Outer Space Treaty must be upheld, particularly as commercial activity proliferates. While states are investing heavily in militarizing Earth orbits, a consensus may emerge towards innovative mechanisms that commit states to maintain LEO as a stable environment. This could include elements related to maneuver notifications, limitation or ban of destructive anti-satellite tests, and shared safe-operation corridors. Beyond these technical solutions, sharing data and information will represent a challenging issue and will have to be addressed in a pragmatic manner at the right international level.

Preparing for tomorrow

Today's challenges require bolder new solutions. This observation is not new. For example, in earlier work on space situational awareness (SSA) – including the EUSST/TraCSS Advancing Concepts for Global Coordination on SSA study, the UN COPUOS Guidelines for the Long-Term Sustainability of Outer Space Activities (2019), and the IADC Space Debris Mitigation Guidelines – a diverse set of governmental, commercial, and academic stakeholders identified three recurring challenges:

- The absence of globally accepted technical and operational standards;
- Fragmentation among national and commercial SSA systems; and
- The lack of durable mechanisms for reciprocal data exchange and coordination.

The collective conclusion from those efforts was that long-term orbital safety depends on transparency, interoperability, and trust. The same logic applies to the governance of space resources: sustainability depends on the sharing of opportunity just as orbital safety depends on the sharing of information.

However, it is equally clear that action is needed today. New impetus and a fresh perspective are needed in those international fora that, for too long, have been debating these problems without reaching solutions. For these reasons, the recommendations identified by the contributors of this report are not only in line with the principles evoked above, but can realistically form the basis of actionable short to mid-term best practices, both for governments and for the private sector.



These recommendations are meant to serve the entire space community with no discrimination and with the objective of ensuring a sustainable future for all space activities.

References

1 The survey was carried out by YouGov as part of research for this report from November to December 2025.

2 This number is set to increase even more dramatically with the filing submitted by SpaceX to the US Federal Communications Commission (FCC) in January 2026 for up to one million satellites to support a "SpaceX Orbital Data Center" system. Blue Origin followed in March 2026 filing plans for a constellation of up to 51,600 satellites.

3 A company wholly owned by SpaceX.

4 For example, the Commercial Space Launch Competitiveness Act of 2015 signed by President Barack Obama has opened the possibility "for American citizens to undertake the exploration and commercial exploitation of space resources." Other nations such as Luxembourg orand the UAE have passed similar laws.

5 See for example: https://www.bbc.com/news/world-europe-45448261; See also https://edition.cnn.com/2025/11/09/europe/russian-satellite-spying-explainer-intl

6 See Global Counterspace Capabilities, An Open Source Assessment, Executive Summary, Secure World Foundation, April 2025, p. XVIII (It can be found at : https://www.swfound.org/publications-and-reports/2025-global-counterspace-capabilities-report)

7 If only measured by the number of launches carried out in 2025 and by the number of satellites orbited during the same year (respectively 92 and 371).

8 ASD Eurospace – Facts and Figures 2024.

9 See the U.N. document (A/AC.105/2018/CRP.21) referring to these guidelines at https://www.unoosa.org/res/oosadoc/data/documents/2018/aac_1052018crp/aac_1052018crp_21_0_html/AC105_2018_CRP21E.pdf

10 Àustria, Belgium, Cyprus, Estonia, Germany, Lithuania, Poland, Portugal, Romania, Slovakia, Sweden, and the United Kingdom

11 As reported in the Space XSpaceX semi-annual constellation status report with the Federal Communications Commission (FCC),, 1st July 2025, and quoted by Hugh Lewis, Starlink Manoeuver Update July 2025, https://www.linkedin.com/pulse/starlink-manoeuvre-update-july-2025-hugh-lewis-utkhehttps://www.linkedin.com/pulse/starlink-manoeuvre-update-july-2025-hugh-lewis-utkhe

12 See https://spacenews.com/china-and-u-s-take-initial-steps-toward-space-traffic-coordination/

13 See ESA's Annual Space Environment Report, ESA, ESOC, ESA Space debrisDebris Office, 21 October 2025 (accessed at: https://www.sdo.esoc.esa.int/environment_report/Space_Environment_Report_latest.pdf). See also NASA presentation, 39th SmallSat Conference, Salt Lake City, UT, 11 August 2025 (accessed at : https://ntrs.nasa.gov/api/citations/20250007454/downloads/20250801_smallsat_OD_intro_final_rev2.pdf)

14 See https://eu.usatoday.com/story/graphics/2025/04/20/space-debris-junk-esa-report/83100972007/

15 Refer to : https://www.nasa.gov/blogs/spacestation/2025/04/30/station-maneuvers-to-avoid-orbital-debris/. See also: https://spacenews.com/space-debris-crisis-the-national-security-threat-were-ignoring/See also: https://spacenews.com/space-debris-crisis-the-national-security-threat-were-ignoring/

16 In 2025, China's crew transportation Shenzhou-20 spacecraft was impacted by a piece of space debris, forcing astronauts aboard the Chinese orbital station to use a replacing ship, Shenzhou-2 arrived only 2 weeks before and initially planned for a six-month long mission.

17 See NASA presentation, 39th SmallSat Conference, Salt Lake City, UT, 11 August 2025 (accessed at : https://ntrs.nasa.gov/api/citations/20250007454/downloads/20250801_smallsat_OD_intro_final_rev2.pdf)

18 ESA's Annual Space Environment Report, ESA, ESOC, ESA Space debrisDebris Office, 21 October 2025 (accessed at : https://www.sdo.esoc.esa.int/environment_report/Space_Environment_Report_latest.pdf)https://www.sdo.esoc.esa.int/environment_report/Space_Environment_Report_latest.pdf)

19 ESA's Annual Space Environment Report, ESA, ESOC, Op. cit. p.16.

20 ESA's Annual Space Environment Report, ESA, ESOC, Op. cit. p.7.

21 ESA's Annual Space Environment Report, ESA, ESOC, Op. cit. p.141.

22 Revell, L.E., Bannister, M.T., Brown, T.F.M. et al. Near-future rocket launches could slow ozone recovery. npj Clim Atmos Sci 8, 212 (2025). https://doi.org/10.1038/s41612-025-01098-6

23 According to ESA data, at least three defunct satellites or rocket stages reenter Earth's atmosphere each day, with some burning up and others surviving to reach the surface.

24 See https://spacenews.com/space-debris-crisis-the-national-security-threat-were-ignoring/

[25] As stated in the following presentation : Glaude (Veronique), ITU Radio Regulations : « First Come, First Served » Concept and Equitable Access to Spectrum/Orbit Resources, Space Services Department, Radiocommunication Bureau, 14 February 2022 (Refer to https://www.unoosa.org/documents/pdf/copuos/stsc/2022/40_ITU_-_First_Come_First_Served_Concept_to_Access_spectrum-orbit.pdf)

[26] "The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind." (Annex, Treaty on principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other celestial Bodies, Refer to https://www.unoosa.org/pdf/gares/ARES_21_2222E.pdf).

[27] As advocated for example by the "European Union Space Act" legislative initiative under discussion in 2026.

[28] For example, the following statement was provided in the UN MettingsMeetings Coverage and Press releases dated 1 November 2024 : Also approved without a vote was a text on "International cooperation in the peaceful uses of outer space" (document A/C.4/79/L.9), by which the Assembly would urge Member States, in particular those with major space capabilities, to contribute to preventing an arms race in outer space. By further terms, it would urge Member States that have not yet become parties to international treaties governing the uses of outer space to consider ratifying or acceding to them, and Member States that are not yet members of the Space Committee to consider applying for membership. Refer to https://press.un.org/en/2024/gaspd815.doc.htmFourth Committee Approves Two Resolutions, Two Decisions on Outer Space, Including Texts to Appoint Latvia, Djibouti to Committee on Realm | UN Meetings Coverage and Press Releases

ANNEX

THE GLOBAL SPACE COUNCIL

The Global Space Council is a group of space leaders and experts who are focused on raising political and public awareness about the threats posed by the overcrowding of outer space and the overconsumption of our shared space resources.



Anders Fogh Rasmussen
Former Prime Minister of Denmark, former NATO Secretary General



Agostinho Linhares
Executive Director of the Instituto de Pesquisa para Economia Digital – Digital Economy Research Institute (IPE)



Katya Echazarreta
Founder of the Fundación Espacial and Space for Humanity Citizen Astronaut



Xavier Pasco
Director of the Foundation for Strategic Research



Sara Sabry
Astronaut, Engineer, and CEO at STRIVE and Deep Space Initiative



Brian Gallant
K.C., 33rd Premier of New Brunswick, Canada



Tidiane Ouattara
President of the Space Council of the African Space Agency



Nicolas Walter
CEO of the European Science Foundation



Ranjana Kaul
Partner at Dua Associates, Vice-President of the International Institute for Space Law (IISL), Subject Matter Expert on the National Advisory Committee (NAC) of the Indian Space Association



Boris Otter
Founding President of Swiss Space Tourism



Marietje Schaake
Non-Resident Fellow, Cyber Policy Center at Stanford University, former Member of the European Parliament

Masami Onoda, Director of the International Relations and Research Department at the Japan Aerospace Exploration Agency (JAXA) and GSC member, also contributed to the report.

All members of the Global Space Council have participated in their personal capacity.
The final outcome is a shared collaborative understanding and does not fully encapsulate all personal views expressed during the meetings.

