

Sustainable Space: Legal & Regulatory Aspects

A Summit for progress on legal and regulatory aspects of Sustainable Space in the United Kingdom and beyond

1st June 2023, Higgs Center for Innovation, Edinburgh

Rapporteur: Toby Kelly-Simpson

Editors: Nic Ross, Declan Dundas



NGC 7496 as observed by the *James Webb Space Telescope* MIRI. MIRI was built by the MIRI Consortium, with the UK lead being the UK ATC based at the Royal Observatory, Edinburgh.

Image Credit: NASA, ESA, CSA, Janice Lee (NSF's NOIRLab), Joseph DePasquale (STScI)



Higgs Centre
for Innovation

NIPAR 

Sustainable Space: Legal & Regulatory Aspects

A Summit for progress on legal and regulatory aspects of Sustainable Space in the United Kingdom and beyond

01st June 2023, Higgs Center for Innovation, Edinburgh

Introduction

As we transition into the Third Space Age where commercial interests are at the forefront of the space industry, it is imperative for the expanding UK space sector to consider the overlap and interplay between sustainability and space. Commercial needs continue to grow, and it will be necessary for private enterprise, public endeavours, academic interests, policy makers and industry regulators to adapt based on the balance of both commercial needs and potential safety risks and environmental impact.

On 01st June 2023, Niparo held the 'Sustainable Space: Legal and Regulatory Aspect' summit kindly hosted at the Higgs Centre for Innovation in Edinburgh, Scotland. The motivation for the summit was to (i) critically examine the current paradigm and the near future of UK space sustainability and (ii) create a crucible where likeminded individuals could come together and make tangible progress. The event included presentations and discussion on the sustainability-centric progress of the UK space industry and topics covered included:

- Environmentally responsible use of space, both downstream and upstream;
- The effectiveness of current legislative and regulatory positions relevant to sustainable space;
- Contemporary commercial progress towards sustainability in the UK space industry and,
- Threats, issues, and potential solutions raised in both commercial and academic spheres relating to sustainable space.

This report summarises the "June First" summit which involved 43 people travelling to Edinburgh, approximately half of which came from the Edinburgh area. The demographic of the meeting was predominantly (60%) white men and 5 out of 9 presentations were given by white men. All career stages were covered. A rigorous carbon accounting or demographics survey was not carried out.

Outer Space Treaty 1967

Sustainability is not defined by the 1967 Outer Space Treaty (OST). Article II of the OST notes “Outer space ... is not subject to national appropriation”. Article IX says that States should explore without “adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter” and allows states wide discretion in policing themselves. As such, the environmental guidelines within the OST are exceptionally soft and indeed the OST is silent on many aspects of contemporary space sustainability.

As a workaround for Article II, certain states (e.g. the USA with the U.S. Commercial Space Launch Competitiveness Act and Luxembourg with the Law of July 20th 2017 on the Exploration and Use of Space Resources) note that although a state or other legal entity cannot own the Moon or other celestial objects, space resources are capable of being owned and States/private companies can extract and sell resources derived from these objects for profit.

Accordingly, it was briefly debated whether the OST is outdated due to its lack of consideration of sustainability. Although international space law still remains valuable, the commercialisation of space highlights a significant shift in motivations.

Another topic of discussion was the comparison of the OST and preemptive treaties with the role of reducing conflict, which exist in environmental terms (e.g., High Seas Treaty) but do not cover sustainability as a focal point. Although the treaties of the High Seas are seen as a good jumping off point for Outer Space normative behaviours, the exact nature of translation remains unclear.

Ownership and Colonist Patterns in Space

Presentation & discussion, led by Fionagh Thomson (Durham University)¹

Concerns were raised about the possibility of the rise of colonial structures through space activity. As per evaluation in relation to the Great Pacific Garbage Patch, the increasing non-biodegradable debris in space exists for decades by the fault of humankind. This links into the conceptual absence of ownership being viewed in the same manner as waste, which has been established in the Western economic sphere. One overarching point was made regarding the dominance of countries with

¹ Thomson, F (2023, *in prep.*), “Knowing me knowing you: a critique of the UK Space strategy” in M. Pozza (Ed) *Space Law and Foreign Policy*, Springer.

thriving space industries in terms of maintenance of traffic orbits, posing colonial patterns in the preservation of the status quo through a lens of space safety. The idea of unchanging traffic orbits may demonstrate colonial characteristics with the unwillingness to progress, even if protection of space appears to be the overall ambition.

It was also questioned whether an informal code is a sufficient method of preventing colonial attitudes in space, and how it would be best to ensure that all nations are heard throughout regulatory processes which could be connected to the state system. Filling in gaps between regulators and the state could be a key factor in encouraging harmony in the international space theatre.

Other International Agreements

The constitution of the International Telecommunications Union (ITU) regulates the use of radio frequencies (RF). The ITU considers the potential for harmful interference and notes RF spectrum is a limited natural resource. However, RF spectrum is regularly left out of discussion on space sustainability despite being the most limited resource in the space sustainability discussion.

Non-binding international agreements have been noted as key within the scope of space sustainability, functioning as soft law guidelines. This category of agreements follows social norms and has the capabilities of setting recommendations for responsible space use by States in a top-down manner. As the agreements are not legally enforceable there are no direct penalties for contravention but their use could prove effective for making progress as a pre-cursor to legally binding agreements.

Commercial Drivers for Space Sustainability

Creating, implementing, and enforcing treaties are difficult tasks, this is particularly true in the contemporary geopolitical climate. There is an opportunity for commercial drivers to accomplish sustainability goals faster and also in an economically effective way.

The concept of incentivising commercial operators within the space industry was discussed when considering approaches to encouraging sustainable behaviour. Incentives may be effective to compensate for regulatory or legislative gaps, offering companies success-driven benefits for demonstrating sustainable practice. For example, it was suggested that insurers or investors may influence companies if

they compel research and substantiation of the eco-friendliness of their operation prior to a launch. Incentivisation for good results of environmental assessment could also act as a certification for good space sustainability in practice as well as cheaper licensing above an approved standard (although concerns were raised about difficulties of additional paperwork and extra bureaucracy). Benchmarks for how regulation responds to data on technological advancements may be considered when questioning compliance monitoring, how it is carried out, and solutions based on ownership and responsibility of space activity. Commercial viability remains uncertain in the ambit of these issues. However, it was noted that commercial drivers should work in harmony with regulation and legislation, not as a widespread substitute.

Potential advantages in State intervention were discussed, reflecting on whether it would be more favourable for sustainability (as well as technical) goals if launches, at least initially, were limited to state activity as opposed to commercial activity.

Investment in space sustainability was mentioned, but it became apparent that there is a lack of transparency to what determines space sustainability when it comes to venture capital funding. ESG was discussed, and there was reserved optimism that good sustainability practice in the space sector and ESG funding could align and be for the common good. The topic of ESG is nuanced though little ESG funding is currently present in the UK space sector.

Current Legislative and Regulatory Scope

One of the main questions regarding domestic space law is the balance and contemplation of whom regulation benefits. Needs as a result of regulation affects the industry and the public in different ways, requiring appraisal of speed and the economy, in addition to efficiency weighed up with environmental protection. Launches are not currently subject to statutory trading regimes relating to emissions although this is mandatory in other domestic law. Within discussion, it was made clear that regulation favours flexibility and tends to work slightly more to the advantage of operators as opposed to the public, leading to consideration of whether this is strong enough in achieving good space sustainability objectives in domestic law.

As states are typically the benefactors of space activity and as commercial efforts build within the industry, professionals will increasingly discuss the balance of objectives and potential risks between states and companies. The impact on airspace and air traffic control was examined through presentation of a case study, highlighting the environmental detriments of CO₂ emissions caused by rerouting as

a result of spaceflight activities from e.g. the north of Scotland. Rerouting requires air traffic to spend more time in flight and consequentially, increases fuel investments and the complexity of licensing and planning. Potential outcomes within operations must be distinguished and airspace protected accordingly, accentuating the volatile trajectorial nature of spent rocket recovery. Moreover, the CO2 emissions by the re-routed aircraft might (drastically) exceed that of the rocket launch. It was suggested that airspace structure could be determined in line with the necessity to curtail negative ramifications to commercial and military traffic. Analysis of costs and downrange effects should be measured, principally within countries with thriving space industries in the aim of accountability and transparency.

One method of reducing space debris is re-entry, taking place in the form of a spacecraft's return to Earth. Recovery concerns relating to the marine environment and maritime safety within the area require mitigation within regulation. Regulatory grey areas relating to re-entry were emphasised, as well as the potential for multi-jurisdictional licensing issues arising across import or export processes involving three territories. The overlap between regulation of space, airspace, the sea, and business requires forethought in reaching sustainable goals.

Critically, it was stated that the regulator, the Civil Aviation Authority, (CAA) is not responsible for policy and their primary consideration is safety. This means that although environmental impacts are assessed, e.g. for Spaceport and Launch licensing, via the Assessment of Environmental Effects (AEE) safety considerations will always take precedence over sustainable ones.

Tools for Accessibility of Information in Space

Efforts towards providing accessible information to the public in the form of an open-source platform was presented, with the goal of giving a method of ensuring sustainability compliance according to regulation and good practice. Access to material which equally supports different sized businesses within the industry creates a fair process of identifying challenges and threats to sustainable progress. The development of sustainable design with the goal of decreasing environmental harm caused by e.g., lithium-ion batteries and debris, as well as assessing opportunities for innovation and solutions operates as a customisable tool depending on individual needs. Provision of a tangible resource containing effective guidance and advice could act as evidence of the UK's effort towards a precautionary attitude to space sustainability. It was noted that operators could benefit from having a central means of information in addition to open industry contribution to

innovative solutions, affording regulators consistency and reliability in measuring the impact of spacecraft missions in accordance with sustainability goals.

Space Sustainability: A Paradox?

Another conversation included focus on the concept of the space sustainability paradox, which suggests that the growth of the space sector to address e.g. UN Sustainable Development Goals (SDGs) is leading to unsustainable practices in the space environment itself. Speaking to the current regulatory stance on sustainability, it has been suggested that space's common resources may diminish corresponding to the upsurge of space activity which prioritises individual objectives as opposed to sustainability risks. Another factor worsening the paradox-effect is industry-based language misconstruing environmental-friendliness, e.g. high-performance green propellants which are non-toxic but are not sustainable. One proposal to combat the space sustainability paradox is the creation of a circular framework corresponding to the economy of space, which could be produced by the UN and encourage international communication by stakeholders. International communication in this way could include a 'Three Zeros' framework: to eliminate debris propagation, to eliminate damage of the earth's environmental boundaries, and to eliminate unsustainable resources used in space activity.

The Future of Sustainable Space

Collaboration between each country in the UK is a core value amongst discussion of the future of sustainable space in both upstream and downstream practice. Wales is looking to create a roadmap similar to Scotland's and has emphasised the need to unite as one voice in order to further achieve goals of sustainability. Regulation alone may not be enough for sustainable progress and it is also crucial to account for opinions outside of the 'Global North' space industry proportionately. Transparency in national collaboration throughout the process of creating an effective strategy for change was emphasised heavily.

A considerable factor of many of the problems raised was the need for a definition of 'sustainability', and discernible limits to what may or may not be deemed sustainable space activity. The idea of outlining operations on the basis of 'good practice' as opposed to 'best practice' was considered, due to the varying needs and

complexities of operations. A combination of political will and commercial drivers may incite subjectivity according to individual needs, leaving ambiguity without precise boundaries and mechanisms of enforcement.

Without enforcement tools and substantial Space Situational Awareness (SSA), investment in systems themselves will be required for compliance. SSA is not generally open-sourced data, and the knowledge is subsequently not easily inaccessible. The current reach of SSA leaves the assignation of either causation or fault uncertain, especially when considering that there has been no litigation or case law in this area. Linking the space industry to consumer needs, it would be beneficial for transparency when compiling precise restrictions and information as well as filling a gap in the market for such an outlet.

Call to Action and Immediate Ways Forward

We present directly and immediately implementable actions that will increase the use of space in an ethical and sustainable manner.

Technical

- RF Spectrum has to be always be considered in the sustainable space discussion.

Legislative

- Make sure the U.K. *does not* bring forward primary legislation that allows for a work around of Article II of the OST.

Regulatory

- Benchmarks for how regulation responds to data on technological advancements may be considered when questioning compliance monitoring, how it is carried out, and solutions based on ownership and responsibility of space activity.
- Require the Orbital Operator licence have an attached AEE.
- The Orbital Operator Licence should include the new “5 year rule”, under which, spacecraft that end their lives in orbits at altitudes of 2,000 kilometers or below will have to deorbit as soon as practicable and no more than five years after the end of their mission.
- Decouple environmental concerns and licensing from spaceflight (safety) licensing in order to avoid any ‘balancing act’. This could, but does not have to be accomplished under the same regulator.

Financial

- True transparency in ESG and financing for space portfolios.

- A “Space Sustainability Bonus” for spaceflight, akin to a ‘No Claims Bonus’ for road travel, should be adopted by the UK insurance sector.

Epilogue

During the writing of this summary, three major new policy initiatives were announced.

First, the World Economic Forum, in collaboration with ESA published the Space Industry Debris Mitigation Recommendations (www.weforum.org/agenda/2023/06/orbital-debris-space-junk-removal); second the ESA lead Zero Debris Charter initiative was announced (<https://esoc.esa.int/esa-announces-zero-debris-charter-initiative>) and third, the Memorandum of Principles from the Earth & Space Sustainability Initiative (<https://www.essi.org/#memorandum>) were declared.

Although too earlier to consider the direct impact of these policy initiatives, there definitely appears that the only thing growing more quickly than the potential for a space debris catastrophe is the real and ready desire to prevent it.