The New Space Economy: Sustainability in Broadcasting

HNR

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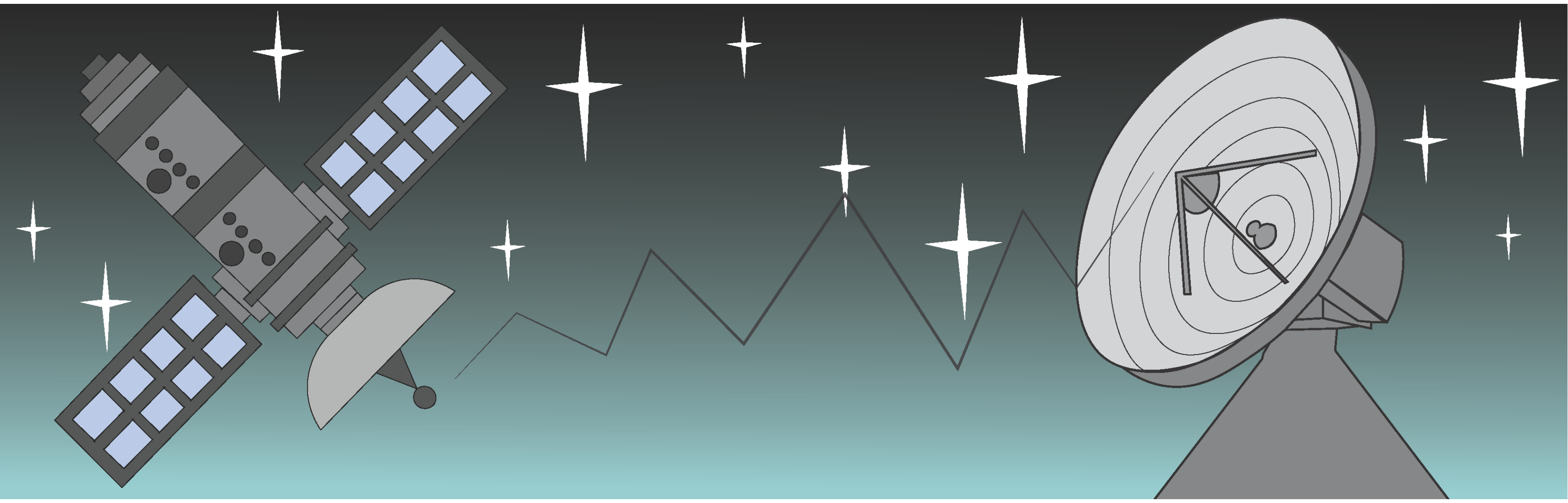


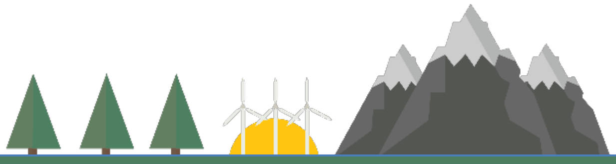
Setting the Stage: Why space Sustainability Matters Now

The growth of the "New Space Economy" has made space an indispensable arena for commercial and societal activities. Ensuring the sustainable use of space is no longer a peripheral issue but a central concern for international policy and corporate responsibility.

This imperative is particularly relevant for the broadcasting and telecommunications industries, whose global operations are fundamentally dependent on satellite infrastructure. At the same time, these companies are working towards reaching net-zero over the coming decades, despite an increase in space activities.

Satellite constellations also enable services that extend beyond connectivity, playing a vital role in climate monitoring, disaster response, and global communication. The International Telecommunication Union (ITU) estimates that most of the United Nations Sustainable Development Goal indicators rely on data from Earth observation (EO), remote sensing, and navigation satellites.

This paper examines the sustainability challenges and opportunities associated with broadcasting and telecommunications satellites. It analyses their environmental footprint and governance frameworks and outlines a strategic pathway through which industry stakeholders can promote the responsible use of the orbital environment.



The unpredictability of this environment continues to pose operational challenges, underscoring the importance of sustainable practices.

The Broadcasting Satellite Nexus: Linking Media Infrastructure and Orbital Sustainability

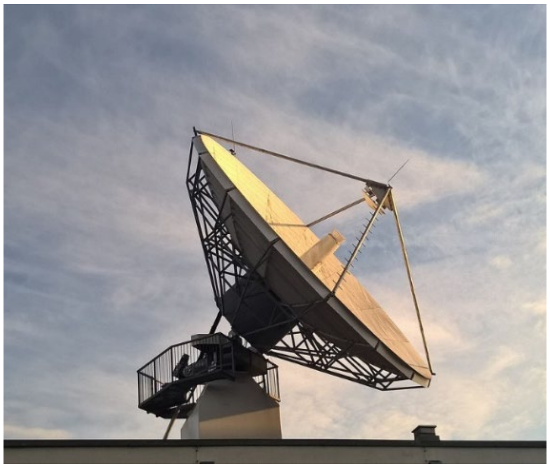
Broadcasting and space technology are tightly intertwined. Today's global broadcasting system could not function without satellites. Geostationary Earth Orbit (GEO) satellites provide television channels and radio stations to billions of people, and broadcasters depend on these orbital relays to reach audiences worldwide. Increasingly, hybrid architectures combine satellite capacity with terrestrial broadband and content delivery networks, extending reliable reach even to remote areas.

In recent years, the industry has witnessed a dramatic shift towards a new generation of Low Earth Orbit (LEO) mega-constellations, such as Starlink and OneWeb, which offer low-latency, high-bandwidth connectivity.

The scale of deployment has been unprecedented, with a drastic increase in objects launched over the last five years. This highlights both the industry's transformation and the mounting pressure on orbital environments.

Satellite connectivity also serves as a crucial resilience asset. Satellite Internet of Things (IoT) networks ensure operational continuity when terrestrial infrastructure fails, maintaining links during natural hazards and other emergencies.

This growth shows no signs of slowing, with much of the expansion driven by privately owned mega-constellations that are reshaping the governance landscape of space. However, this expansion is not without consequences. The effectiveness of satellites in both GEO and LEO systems depends on orbital availability and open frequencies—resources the ITU has warned are becoming increasingly congested. **This creates deeper sustainability concerns that extend beyond terrestrial infrastructures.**



The Environmental Footprint of Broadcast Satellites

The environmental and resource impacts of a satellite's lifecycle are often overlooked in the broader sustainability discourse, which tends to concentrate on terrestrial infrastructure. Yet, satellites carry a substantial footprint across their entire lifecycle.

This lack of recognition mirrors a challenge we at Humans Not Robots (HNR) have identified within the broader digital landscape: environmentally intensive digital infrastructures are frequently under-measured and under-reported.

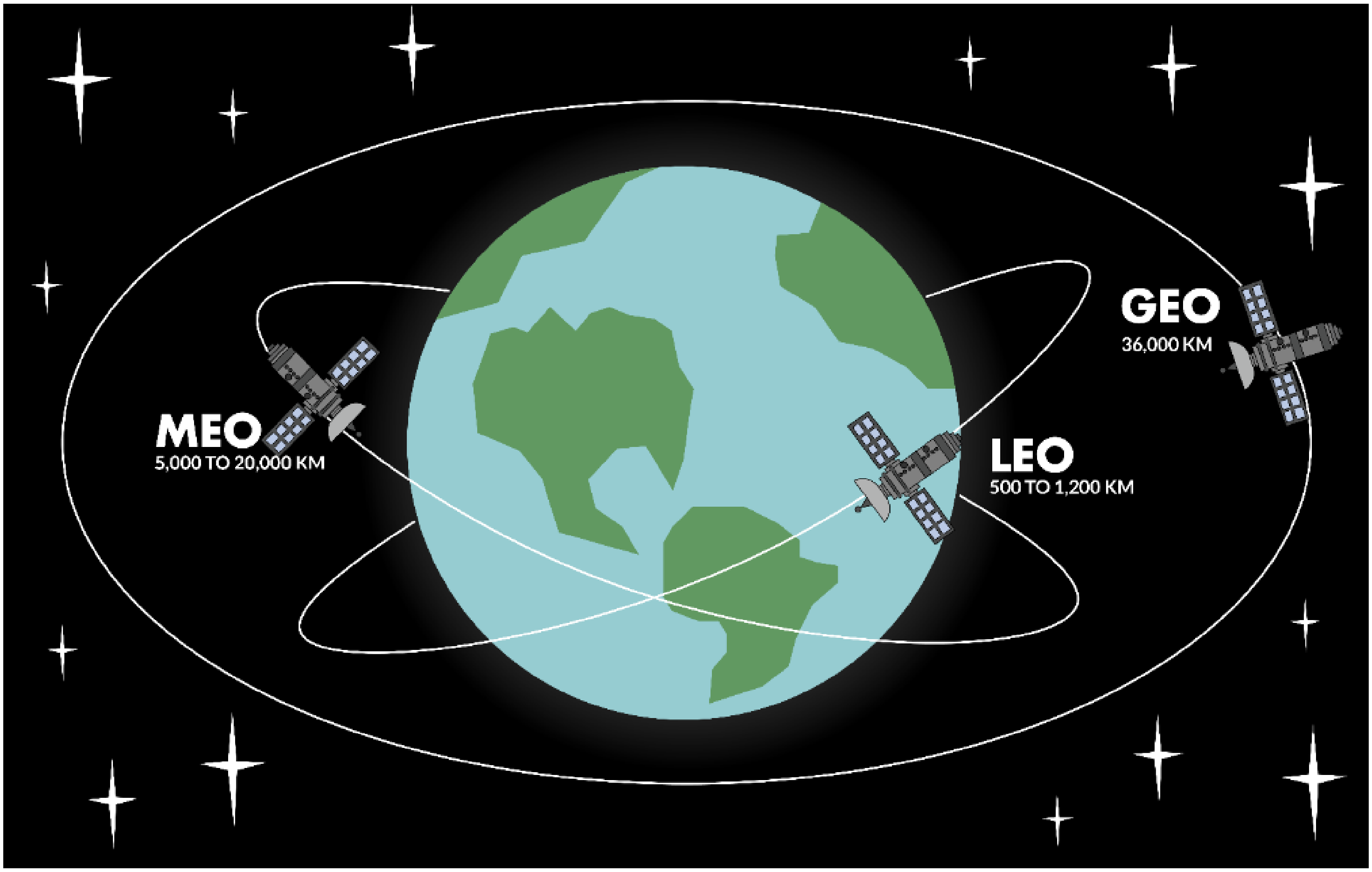
We aim to bring greater understanding and transparency to the resource and energy footprint of digital systems by providing tools that help organisations measure and, in turn, reduce their impacts.

Accounting for the impacts of assets in Earth's orbit is essential if organisations are to capture their full Scope 3 emissions and embed meaningful accountability across the broadcasting value chain. Satellite manufacturing is a resource-intensive process. Components and sensors are built from scarce materials such as gold, titanium, lithium, and gallium. These extraction activities are frequently located in jurisdictions with weak environmental and labour regulations.

Once built, satellites must be launched, a process with a significant atmospheric footprint. NASA's 2024 assessment warns that the launch tonnage needed to maintain planned mega-constellations will rise from the current 3,500 MtCO2e per annum to more than 30,000 MtCO2e per annum by 2040. The associated combustion emissions, including carbon dioxide, water vapour, black carbon, and metal oxides, can accumulate in the upper atmosphere, contributing to both ozone damage and climate change.

Sustainability challenges also emerge at the end of a satellite's operational life. Historically, many satellites were abandoned, contributing to the build-up of orbital debris, defined as “all non-functional, human-made objects… in orbit or re-entering Earth’s atmosphere”. This creates a risk of debris collision, which can destroy operational satellites and generate even more debris, potentially leading to a self-perpetuating cycle of collisions known as the Kessler Effect.

Although missions are in place to improve debris removal, the solution is both legally and technologically difficult. The European Space Agency (ESA) now estimates that Earth’s orbital environment already contains over 100 million objects, with more than 99% being smaller than 10 cm. While collisions with fragments of this size are generally non-catastrophic, they could still cause critical failures in functions such as communications, negatively impacting quality of service.



Despite international guidelines calling for near-universal compliance to achieve effective debris mitigation, actual practice falls short. Recent assessments show fewer than 55% of satellites and 85% of rocket bodies complied with orbital clearance guidelines. The OECD further warns that mathematical models show the tipping point may have already been reached in some regions, causing unstoppable growth in debris populations.

Additionally, increasing orbital congestion and radio-frequency interference directly threaten the reliability of broadcast services. This threat arises from two key factors. First, the sheer volume of satellites, particularly within LEO mega-constellations, is limiting the number of available orbital paths and increasing the probability of physical collisions. Second, the radio spectrum used for satellite communication is a finite resource. As more satellites transmit, the potential for overlapping frequencies increases, leading to disruptions in broadcast transmissions.

For a sector where uninterrupted signal delivery is imperative, the degradation of the orbital environment poses a significant operational risk.

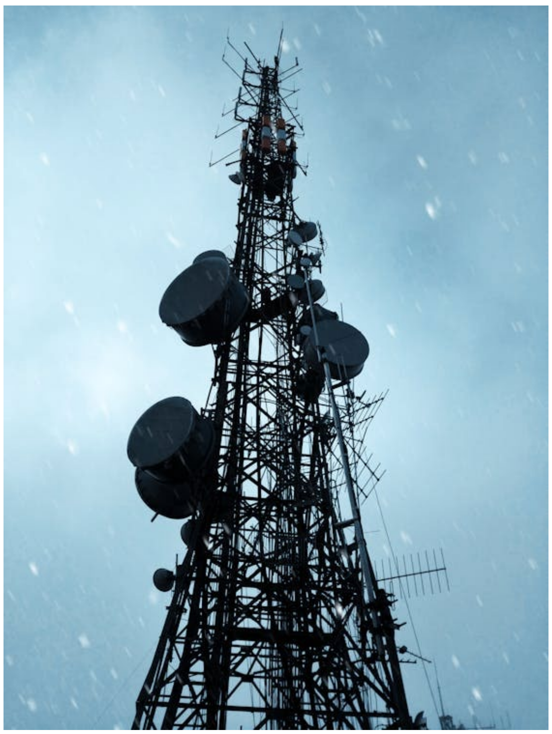
Policy and Governance Landscape

Frameworks have been developed from both national and international governance perspectives to address the sustainability challenges of increased space activity. While these initiatives acknowledge the risks, they also reveal a considerable lack of technological readiness and standardisation to mitigate them effectively.

Key initiatives include the UN COPUOS Long-Term Sustainability Guidelines and the ESA's "Zero Debris Approach," which aims to limit debris production significantly by 2030. It also urges the International Organisation for Standardisation (ISO) to evolve its requirements to ensure better technologies for debris removal.

Alongside these governance efforts, satellite manufacturers are integrating circular economy principles into their design and operations. Thales Alenia Space provides a prominent case, investing in end-of-life satellite solutions and developing new in-orbit servicing vehicles that can repair, refuel, or safely de-orbit spacecraft.

For the broadcasting sector, these developments are highly relevant: life-extension technologies and safe disposal strategies lower the emissions, resource use, and financial costs embedded in their Scope 3 supply chains.



This green shift can also be helped by responsible government decisions due to the large degree of state involvement in the space industry. This is true for national space agencies and other space organisations such as Eutelsat. Despite being a public limited company, it is 10.89% owned by the UK government and 13.59% by France. This gives state actors the power to influence its sustainability policy. A significant shift has recently been seen with Eutelsat, which has pledged to halve its energy-related greenhouse gas emissions by 2030. As one of the largest broadcast satellite operators in the world, this shows the potential of government action through investment decisions.

The broadcasting sector is also building its own methods for calculating its environmental footprint. The Low Carbon TV delivery project (LoCaT) develops methodologies to evaluate and reduce the carbon emissions of delivering TV content. Its most recent report bridges terrestrial and space delivery considerations, offering a framework that broadcasters can use to capture satellite operations in their sustainability reporting.

Despite these advances, significant governance and policy gaps persist. A particularly pressing issue is the absence of standardised sustainability reporting. The OECD cautions that without standardised measurements for satellite lifecycle metrics, information asymmetries arise that can skew risk perceptions and lower the apparent cost of unsustainable practices.

For the broadcasting sector, limited transparency makes it difficult to incorporate satellites into sustainability reporting, obscuring the full environmental costs of providing global communication services.

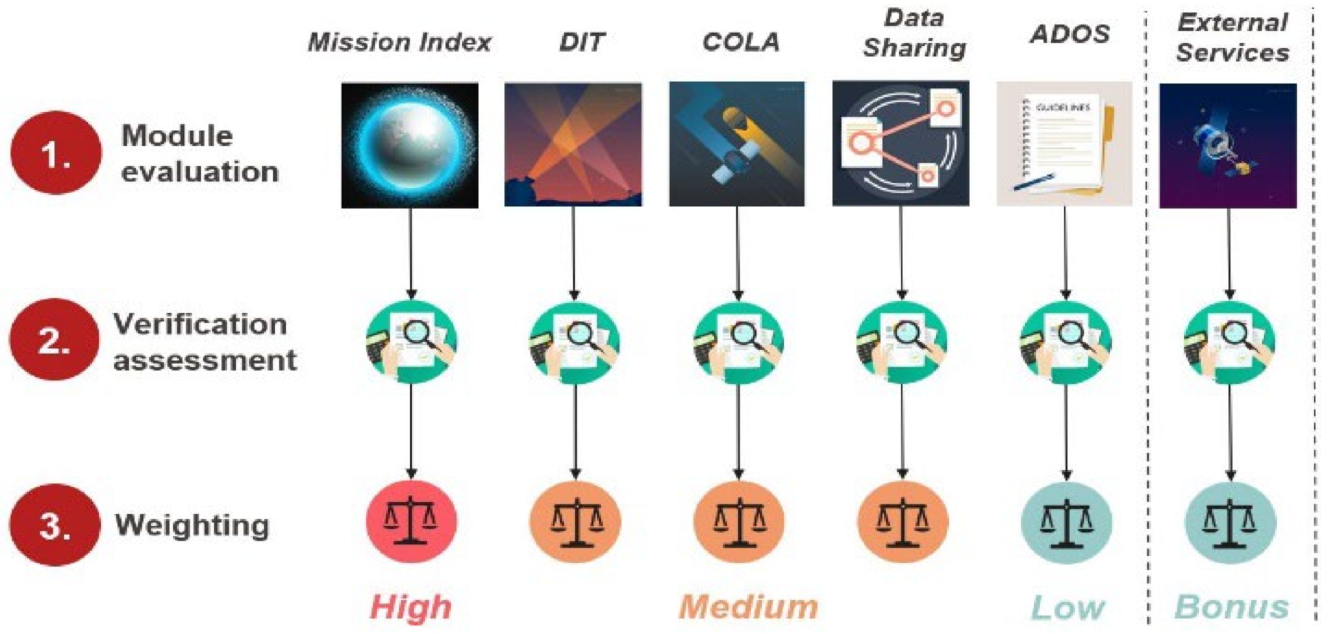
Recommendations for Broadcasters

As primary users of satellite infrastructure, broadcasters have both the responsibility and the leverage to shape industry practices and support sustainability in space.

An essential first step is integrating satellite operations into ESG strategies. Broadcasters should recognise these operations as part of their Scope 3 emissions and incorporate the full lifecycle—from manufacturing and launch to operation and disposal—into their carbon accounting. This will enable more accurate emissions reporting and align broadcasting activities with broader corporate sustainability goals.

Sustainable procurement represents another powerful tool for change. Broadcasters typically lease capacity from satellite operators, giving them influence over supplier practices. By choosing to work with operators who demonstrate compliance with debris mitigation standards, employ green propulsion technologies, or use recycled and responsibly sourced materials, broadcasters can accelerate the adoption of cleaner technologies across the sector.

The 'Space Sustainability Rating' (SSR) was created with this in mind. It uses data to assess the sustainability of space missions through weighted categories relating to mission purpose, data transparency, operations, and measures taken to minimise space debris. This aids transparency for stakeholders, allowing broadcasters to base a sustainable satellite procurement strategy on these metrics.



(Space Sustainability Rating, n.d.)

Procurement transparency is also crucial. Making data on supplier sustainability publicly available empowers consumers and investors to make more informed choices, enhancing accountability throughout the value chain. As transparency is increasingly demanded by customers, and more firms report on value chain emissions, falling behind in this regard can negatively affect an organisation's reputation.

Broadcasters should also use their contracts to favour environmentally responsible operations. If major customers demand green propulsion, compliance with debris mitigation, and satellite reusability, it will accelerate the adoption of these technologies. This approach can be reinforced by industry coalitions or standards; for example, broadcasters could work with satellite providers on a sustainability charter or support initiatives like the SSR to incentivise best practices. In doing so, they not only protect their operational future but also reinforce their role as responsible actors in the new space economy.

Looking Ahead: The Future of Space Sustainability in Broadcasting

The expansion of space activities is inevitable and offers many opportunities, but it also raises issues around the infrastructure and regulations needed to make this expansion fair and sustainable.

As satellites underpin modern communication and economic activity, broadcasters and satellite operators have a pivotal role in promoting sustainable space use. Integrating satellite supply chains and operations into ESG accounting would allow companies to disclose emissions, materials use, and end-of-life practices.

Satellites themselves can play an important part in promoting sustainability on Earth. Through the use of EO data, they have recently been used to tackle issues such as illegal logging and deforestation, as well as aiding reforestation efforts by monitoring tree growth and assessing forest health. They can also help predict the power output of solar farms, leading to a more efficient expansion of solar energy.

Considering these challenges and opportunities, broadcasters have a unique responsibility. They should include satellite operations in their ESG strategies by quantifying emissions and resource use across the entire lifecycle.

This will prove essential for both terrestrial and orbital sustainability, as well as the continued viability of satellite networks.

Ready to drive meaningful change in your organisation's approach to satellite and sustainability? **Contact the Humans Not Robots team to learn more about our tools, insights, or to explore collaboration opportunities. Together, we can build the future of responsible, resilient broadcasting.**

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