



**INTERNATIONAL
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Financial Sustainability: an Essential Element for Industry to Meet Environmental Progress in the Space Sector

An IAF Industry Relations Committee White Paper



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Abstract

Space agencies the world over are interested in and actively working on defining and applying policy and regulation to encourage more sustainable access to and use of space.

At the same time, many active space companies are committing to Environmental, Social and Governance (ESG) guidelines in their business conduct. The environmental considerations referring to pollution prevention, circular economy and lower energy consumption, enable the reduction of the space industry's footprint on our environment, in and out space.

Financial actors are interested to invest in what is already environmentally friendly today (green finance) and what is transitioning to more environmentally focused performance levels over time (transition finance).

Still, over time, it has become clear that the business impact of transitioning to more sustainable business practices has been more severe than expected: market shares have been lost, production has become expensive, and thousands of jobs are at risk worldwide. This shock has caused an adaptation, if not a slowdown, of the goals of the green transition initially defined (e.g. in the EU Green Deal in Europe).

For the space industry specifically, the economic shocks of the green transition might be more acutely felt, due to the particularities of space funding mechanisms, investment availability, cash flow and payback schedules, and more. Many new space companies have limited runway, and adding sustainability costs to already heavy capital requirements may seriously harm their longevity, despite aspiring to set an example for green operations.

Therefore, the space industry must also consider financial sustainability alongside its other sustainability concerns.

This white paper, built on the IAF Industry Relations Committee's prior work, aims to analyze the current landscape, highlight critical issues, and propose recommendations for governments and regulators to support the space industry through the transition to sustainable operations.

1. Current Greening Effort and Operational Practices in the Space Industry

Unlike many other industrial sectors, the space domain spans both terrestrial and orbital environments. Greening the space industry requires a comprehensive approach addressing multiple critical impact areas, such as launchers and general propulsion subsystems; generation, management and remediation of space debris; overall manufacturing of space assets; required raw materials and associated supply chains, including needed logistic and ground transportation of produced elements, till ground segment infrastructures.

Current **launch systems** rely on toxic and polluting propellants; **orbital debris**, which threatens the safety and long-term viability of low Earth orbit; and the **manufacturing** of space vehicles, which involves high energy use, rare Earth **materials**, and hazardous substances. **Ground logistics** also contribute significantly to emissions, particularly for large or heavy payloads. Additionally, global **supply chains** often depend on unsustainable mining practices and lack of transparency and circularity. Finally, **ground segment infrastructure**, such as mission control and data centers, demands constant energy and cooling, potentially leading to a high carbon footprint if not powered by renewable sources.

To address its environmental challenges, the space sector is increasingly embracing sustainability through innovative technologies, standards, and operational practices. Key efforts include the adoption of **clean propulsion systems** such as electric drives and non-toxic propellants, and the development of **reusable launch** vehicles to minimize waste. **Eco-design** principles and life-cycle assessments are guiding more sustainable engineering choices from inception to end-of-life. **International standards** like ISO 24113 and IADC guidelines are shaping debris mitigation practices, while active debris removal and autonomous deorbiting are gaining traction together with complex in orbit servicing capabilities to **repair, recycle, reuse and extend** capabilities and life span of flying assets. Many companies are also implementing **certified environmental management systems** (e.g., ISO 14001), improving procurement through responsible sourcing and regulatory compliance, and publishing ESG reports aligned with global disclosure frameworks to enhance transparency and accountability in their sustainability efforts.

2. Financial Sustainability as a Prerequisite for Environmental Progress

In parallel to all what above described, the rapid expansion of the space ecosystem (with more frequent satellite launches to emplace large constellations and support ambitious exploration missions) is generating scrutiny on the space industry's environmental footprint.

The space industry now stands at a critical intersection. Growth, innovation, and competitiveness must be balanced with sustainability and long-term resilience.

Evidently technological innovation and regulatory frameworks play critical roles in achieving environmental sustainability and resilience, but it is equally manifest that financial sustainability and resilience shall be one of the linchpins that ensures these efforts are viable, scalable, and enduring.

Thus, while an increasing part of the global space community sets progressively ambitious environmental targets, the financial realities of implementing these goals cannot be overlooked. For space companies to play a leading role in advancing sustainability they must be financially resilient.

3. The Financial - Environmental Link

Achieving environmental goals in space requires significant investment. Without stable, long-term financial planning and investment, many of these green innovations remain out of reach.

Financial sustainability enables companies to fund research and development, build infrastructure that supports cited environmentally friendly practices, adapt to changing regulations, and form and train personnel to be able to do so in an efficient manner. It also allows firms to weather possible economic downturns without compromising on their sustainability commitments. Similarly, financial sustainability ensures that companies can maintain operations, invest in R&D, and manage risks without compromising long-term strategic goals.

In this sense, financial health is not just a facilitator but a prerequisite for short, near and long-term environmental responsibility.

4. Enabling Long-Term Environmental Stewardship

Sustainable financial models help, and must continue helping, ensure that environmental initiatives are not short-lived or dependent solely on public grants or temporary subsidies.

Moreover, financial sustainability encourages long-term thinking, which aligns with the core principles of environmental stewardship. This is particularly important in space, where decisions made today, like the placement, repairing and decommissioning of orbiting satellites, or innovative design procedures and/or adoption of new materials and design practices, can have lasting impacts on orbital environments.

It is a fact that financially robust space companies might be better positioned to:

- Transition to low-carbon fuels or launch alternatives.
- Support circular economy principles in designing and manufacturing.
- Adopt end-of-life satellite deorbiting systems.
- Invest in debris mitigation and remediation, including active removal technologies.
- Etc.

At same time, in the current economic climate, marked by inflationary pressures, disrupted supply chains, and intense global competition, financially fragile firms may deprioritize environmental efforts in favor of short-term survival.

In effect, despite its high-tech image and rapidly growing commercial segments, the space industry remains **financially fragile** in several structural and systemic ways.

This **fragility** stems from both the intrinsic risks of operating in space and the economic architecture that supports it. **High capital intensity** and long development cycles lock in investment for years before revenue can be generated, placing smaller players at risk of funding shortfalls. The **inherent technical**

risks of space missions, including launch failures and system anomalies, can lead to substantial financial losses, while insurance coverage remains costly and limited. **Market demand** is concentrated among a few institutional buyers, exposing firms to geopolitical shifts and procurement delays. **Heavy dependence on public funding** further ties the sector's fortunes to political and economic cycles. **Infrastructure and supply chains** are often fragile and monopolized, vulnerable to disruptions from material shortages or policy changes. Additionally, **the long-term nature and illiquidity of space assets** limit financial agility, and the lack of mature financial instruments and exit opportunities, such as secondary markets or asset-backed financing, constrains investment flexibility across the sector. These factors increase the cost and complexity of adopting ESG standards and green technologies, particularly for SMEs, but also globally the totality of space actors. As a consequence, and unlike fast-moving consumer goods sectors, the space industry requires **sustained investment** over **several years** before returns can be realized.

5. Driving Industry-Wide Change and Enhancing Financial Resilience

Theoretically, it could be said that financially stable organizations can act as role models and industry leaders, setting standards that influence peers and partners. These companies could afford to prioritize sustainability in their supply chains, push for greener launch logistics, and collaborate with environmental monitoring initiatives. Investors and stakeholders are increasingly favoring companies that integrate environmental, social, and governance (ESG) criteria into their core strategies, creating a positive feedback loop where financial and environmental sustainability reinforce each other.

At same time, the current transition landscape exposes key vulnerabilities in the space sector:

- **Regulatory Asymmetries:** Varying national regulations and a lack of harmonized standards for environmental performance create uncertainties that deter investment and increase the cost of compliance and affect local industrial competitiveness.
- **High Entry Costs for “Green” Technologies:** The development and integration of low-emission propulsion systems, reusable launch vehicles, or satellite deorbiting or repairing capabilities require long-term funding strategies, which are often inaccessible without stable financial backing.
- **Limited Access to Green and Transition Finance:** While green finance is on the rise, it tends to favor industries or projects that already meet stringent sustainability criteria. Space companies in transition phases may struggle to attract the necessary funding, especially if their financial performance is volatile or not well understood by investors.

With respect to this last key aspect, and with the goal to enhance financial resilience in a capital-intensive and risk-prone industry, space companies are adopting a range of strategies that improve flexibility, reduce volatility, and attract diversified investment. **Modular and scalable architectures** allow for iterative development and lower upfront costs, while phased deployments and early revenue models help validate technologies and generate returns sooner. **Public-private partnerships** (PPPs) offer critical risk-sharing and long-term stability through co-investment and service contracts. Depending on the market, **vertical integration and supplier redundancy** may mitigate supply chain disruptions and cost unpredictability. Additionally, **flexible financial instruments**, such as milestone-based funding, revenue-sharing, and space-as-a-service models, are aligning capital flow with operational milestones. **Dual-use business models** that serve both commercial and institutional clients

further stabilize revenue streams. Collectively, these approaches not only improve financial durability but also increase transparency and investor confidence, making the sector more accessible to a broader base of capital providers.

6. Policy and Financial Recommendations

Policy wide speaking, to improve the long-term financial sustainability and policy integration of the space sector, space sustainability shall be seen as a must, meaning that responsible entities or local governments should foster **smart interagency partnerships** that connect national space agencies with other key national ministries, and particularly those overseeing **economy, finance, industry, climate, and environment**. These collaborations would enable the design and deployment of **space-specific**

transition investment mechanisms, aligned with national sustainability and innovation goals and later expand to all needed actors. **Global sustainability shall than be the results of local sustainability practices, and as such, as much as possible, internationally agreed and coordinated.**

Starting from all what above, to support the space industry in aligning with environmental goals without compromising their competitiveness and financial health, the following recommendations are proposed:

1. **Stable and Predictable Regulatory Frameworks:** Clear, consistent, and harmonized space sustainability across territories can reduce investment risks and incentivize sustainable innovation. The recently published EU Space Act goes in this direction and provides relevant guidelines to be adopted by space industries (manufacturer and operators) doing business in the European territory.
2. **Support Stable Funding Mechanisms for Space Industry:** Building on recent policy discussions on providing better, more sustainable funding for space startups, governments and financial actors should recognize that venture capital, investment funds, accelerators, bridging the valley of death, and consistent program budgets all contribute to the space industry's ability to operate more sustainably. Greening the space industry should be a clear reason for governments to encourage these schemes.
3. **Access to Transition Finance:** Space sector actors, particularly those involved in upstream activities such as launch services, satellite manufacturing, and propulsion, are often excluded or overlooked in existing transition finance frameworks. Regulators and financial institutions should revise and expand the criteria and availability of transition finance to include all space sector players so to explicitly recognize space activities that contribute to climate action, environmental monitoring, and sustainable digital infrastructure.
4. **Targeted Public Investment and Incentives:** Governments should provide tailored financial instruments and products, such as tax credits, space green transition bonds, or co-investment schemes to support space companies transitioning toward sustainable practices while reducing the capital cost of greening space infrastructure. National coordination among local responsible (space agencies, ministries, etc.) shall be the starting point.
5. **Industry Dialogue and Capacity Building:** Promote industry-wide forums and technical assistance programs to support the integration of ESG metrics into financial planning and risk management.

The development of a dedicated space ESG frameworks would improve industrial eligibility for transition finance by providing clear, measurable criteria aligned with climate goals.

6. **Public-Private Partnerships (PPPs):** Strengthen collaboration between public agencies and private entities to share the financial risks of green innovation projects and accelerate technology maturation.

7. Conclusion

In the evolving space economy, environmental goals (for, from and to Earth) cannot be separated from financial realities.

Financial sustainability is not only about maintaining profit margins; it's about enabling innovation, resilience, and accountability in environmental practices. To truly protect Earth's orbital environment and ensure the long-term viability of space activities, industry must view financial sustainability as an essential pillar of its environmental strategy.

Financial sustainability is not a substitute for environmental responsibility, it is its foundation. Only by aligning the two the space sector can achieve meaningful, scalable, and enduring progress toward a sustainable future. Without it, the space industry's contributions to climate resilience and planetary protection will remain limited in scale and ambition.

Governments and regulators play a pivotal role in creating the enabling conditions that allow the space industry to thrive financially while advancing bold environmental objectives.

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