



THINKING SUSTAINABILITY PRIZE

Author's Perspective

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Earth-Space Sustainability

Original Version

Humanity now lives in a critical time in the history of space exploration. The number of satellites orbiting Earth grows at an exponential rate – a trend attributable to rapid technological innovation and commercialization in the space sector. Space-based infrastructures can potentially bring manifold benefits, including Earth observation satellites that facilitate precise monitoring and verification of carbon emissions^[1] and Internet satellites in low-Earth-orbit that potentially reach the most remote regions on Earth. But the exponential growth in space activities also causes major negative consequences. If this growth trend continues, one in every fifteen stars that appear in the night sky will be fake stars (i.e. artificial satellites) for future generations,^[2] obscuring and altering humans' view of the cosmos for centuries to come. With increasing ventures to other celestial bodies, including the recent rush back to the Moon, scientists have furthermore warned of anthropogenic environmental degradation in the outer regions of the solar system.^[3]

What would this all mean to the future of our quest for sustainability? In fact, sustainability issues on Earth and in space have become more urgently intertwined than ever. In addition to the loss of pristine skies, space congestion or the accumulation of space debris could lead to the loss of critical space infrastructure, causing major disruptions to daily operations on Earth. Beyond Earth's immediate environment, technological capabilities to mine minerals or resources on other celestial bodies not only degrade the environmental integrity of those bodies, but they also reinforce extractivism on Earth. Resource competition in outer space among the rich and powerful, therefore, brings severe social equity and justice-related issues.^[4]

But the current global environmental and outer space governance systems are inadequate to address these deeply entangled environmental and social issues on Earth and in space. Since outer space governance during the Cold War was aimed at promoting peace and minimizing the risks of space militarization, sustainability or environmental issues were only cursorily considered in the formulation of the 1967 Outer Space Treaty. Meanwhile, 'outer' space has also been inherently treated as a separate domain from global environmental governance. With rapid technological advancement taking human agency farther than ever before into the cosmos, whether through spacecraft or advanced ground- or space-based telescopes, it is no longer sufficient for global environmental governance – or more specifically Earth system governance – to treat 'outer' space as an external environment from which planet Earth can separate itself.^[5]

THINKING SUSTAINABILITY*

A program developed by the Louis Roederer Foundation

*Thinking About Sustainability

The concept of ‘Earth-Space sustainability’ was recently introduced,^[6] which calls for a more integrative approach to governing our Earth system and outer space, including justice and integrity on a multi-planetary scale.^[7] The corresponding ‘Earth-Space Sustainability’ (ESS)^[8] initiative was founded in 2020 to raise awareness of these growing interconnections and to forge collaborations across science and policy communities. It aims to extend (or, in other contexts, reignite) the human-nature relationship with the cosmos, which requires scientists and policymakers to incorporate sustainability concerns and environmentalism beyond Earth. Instead of treating outer space as an endless resource, science and policy should aim at deconstructing the mainstream utilitarian approach to space and promote stewardship in order to protect diverse values associated with the cosmos, including cultural and intrinsic. For such transformative governance to take shape, actors with decision-making power, i.e. the industry, states, scientists, and policymakers, must act on the collective interest of the global communities. ESS, through its flagship research project ‘Planetary stewardship in view of Earth-Space sustainability’ (also known as the PlanetStewards Project), contributes to finding solutions to the mentioned issues. The PlanetStewards Project^[9] seeks answers to transforming existing space governance, addressing the conflicting values, norms, and institutions that shape (un)sustainabilities of Earth-Space systems. It examines the effectiveness of various (self-)governance approaches in this context, their coexistence and interactions, and the corresponding impact in terms of environmental integrity and justice on a multi-planetary scale. From billionaire companies controlling large-scale space-based infrastructures to the narrow selection of technical indicators for dark sky, researchers within PlanetStewards trace the underlying causes of failed global consensus on orbital governance. Looking beyond our Earth system, human-driven actions on celestial bodies other than our own put to the test whether the Moon is a project of love and care or one of extractivism. Here, PlanetStewards identifies the scientific and political barriers to Moon stewardship and recommends policy interventions and transformative governance measures.

The PlanetStewards Project, along with many other research projects, be they individual or international, marks the renewal of a political, intellectual, and philosophical era of human-nature relations with the cosmos. Researchers, scientists, citizens, artists, and policymakers have a crucial role to play in transforming existing space governance through interdisciplinary knowledge-making, not just across natural and social sciences but also from history to ethics and philosophy, as well as diverse knowledge systems, to inform stewardship-oriented governance frameworks. The ESS Network initiates platforms and fora for these conversations to take shape,^[10] bridging disciplinary work and knowledge backgrounds toward a common goal – future integrity and beyond-human justice of Earth and space.

^[1] Lenton, T.M. and Latour, B (2018). Gaia 2.0: Could humans add some level of self-awareness to Earth’s self-regulation? 361, 6407: 1066-1068.

^[2] Hartley, R. (2024, September 11). *Our positions and statements—Satellite mega-constellations*. DarkSky International. <https://darksky.org/what-we-do/advancing-responsible-outdoor-lighting/our-positions/>

^[3] Normier, A., Boujibar, A., Boulesteix, D. et al. (2025). A call to address humanity’s cosmic footprint. *Nature Astronomy*, 9, 934–935.

^[4] Yap, X.-S., Janssen, M. A., Aganaba, T., Tutton, R., Korpershoek, K., Profitiliotis, G., Rabitz, F., Subbiah, M. S., & Wagenknecht, L. (2023). Four Alternative Scenarios of Commons in Space: Prospects and Challenges. *International Journal of the Commons*, 17(1), pp. 390–410.

- [5] Yap, X.-S., & Kim, R. E. (2023). Towards earth-space governance in a multi-planetary era. *Earth System Governance*, 16, 100173.
- [6] Yap, X.-S., & Truffer, B. (2022). Contouring 'earth-space sustainability'. *Environmental Innovation and Societal Transitions*, 44, 185-193.
- [7] Yap, X.-S., & Kim, R. E. (2023). Towards earth-space governance in a multi-planetary era. *Earth System Governance*, 16, 100173.
- [8] Earth-Space Sustainability. <https://www.earth-space.today/>
- [9] PlanetStewards Project. <https://www.planetstewards.eu/>
- [10] For example, see <https://www.planetstewards.eu/rethinkingplanetaryandsustainabilitygovernancethroughcosmologicalimaginaries>

