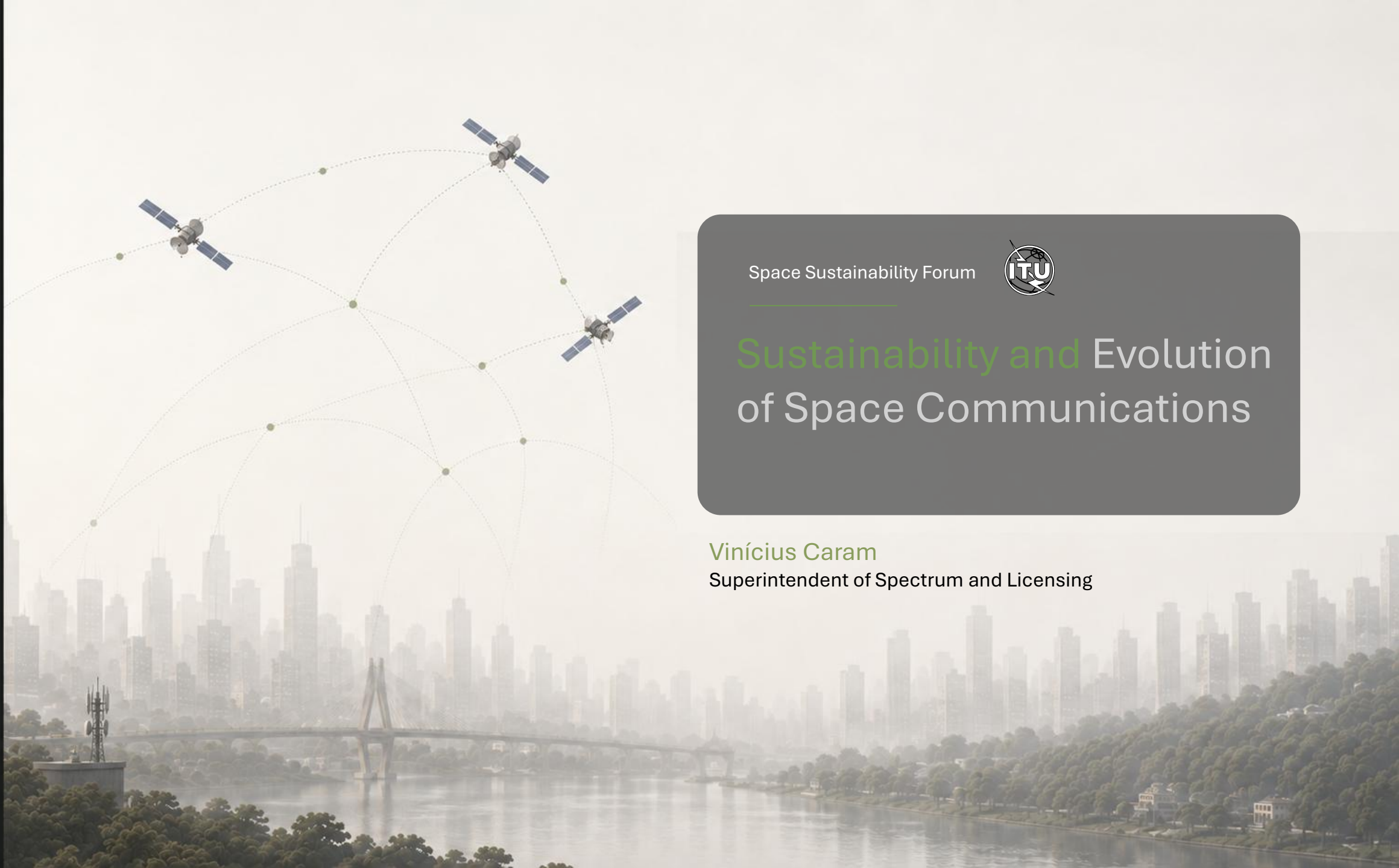




ANATEL

CONNECTING
PEOPLE.
CONNECTING
POSSIBILITIES.



Space Sustainability Forum



Sustainability and Evolution of Space Communications

Vinícius Caram

Superintendent of Spectrum and Licensing

SPACE SUSTAINABILITY

Anatel's actions for better technical assessments and informed decisions on spectrum and orbital resources, today and for the future.



LONG-TERM SUSTAINABILITY

The broader objective is to improve understanding of how different satellite systems can continue to coexist while supporting the efficient use of shared spectrum and orbital resources.



INTERNATIONAL COOPERATION

Active presence in ITU-R working groups addressing space sustainability and regulatory best practices.



EXCHANGE OF EXPERIENCES

Working with the CST team and national experts to share knowledge and strengthen technical capacity.

Regulatory path to space sustainability

RESPONSIBLE USE.
TECHNICAL
ASSESSMENT.
LONG-TERM VALUE.



OCT · 2024

Call for Input No. 12

Launched on Oct 22, 2024, asking about possible actions on space sustainability.

APR · 2025

Board Decision No. 91/2025

The Board orders technical studies and issues a regulatory alert.

2025 – 2026

Regulatory Agenda Item 24

Studies aligned with the Spectrum Use Plan, international best practices and the national market.

IN PROGRESS

Anatel White Paper

To broaden the debate and share information on space sustainability.

What stakeholders told us

RESPONSIBLE USE.
TECHNICAL
ASSESSMENT.
LONG-TERM VALUE.

167
contributions received

Satellite operators,
associations, government
bodies, consultants and
universities.



CONSENSUS

- International coordination, data sharing and space debris mitigation.
- Disclosure of constellation size, authorized bands, de-orbit forecasts and orbital data.
- Alignment with ITU/COPUOS, the GSOA Code of Conduct, IADC and ISO 24113.
- De-orbit rules for N GEO satellites.



DIVERGENCE

- De-orbit timelines and technologies: 5 vs. 25 years.



UNDER DEBATE

- Sustainability indicators: cautious support, harmonized with international initiatives.
- Asymmetric rules: stricter requirements for large constellations.

Ongoing studies: opportunities and concerns

RESPONSIBLE USE.
TECHNICAL
ASSESSMENT.
LONG-TERM VALUE.



SUBMISSION OF PLANS

Possible requirement for end-of-life de-orbit plans, orbital coexistence plans and plans to avoid interference with radio astronomy.



POINT OF CONTACT

Possible requirement for a point of contact to coordinate orbital occupancy.



EFFICIENT SPECTRUM USE

Possible proof of efficient spectrum use as a condition for new authorizations.

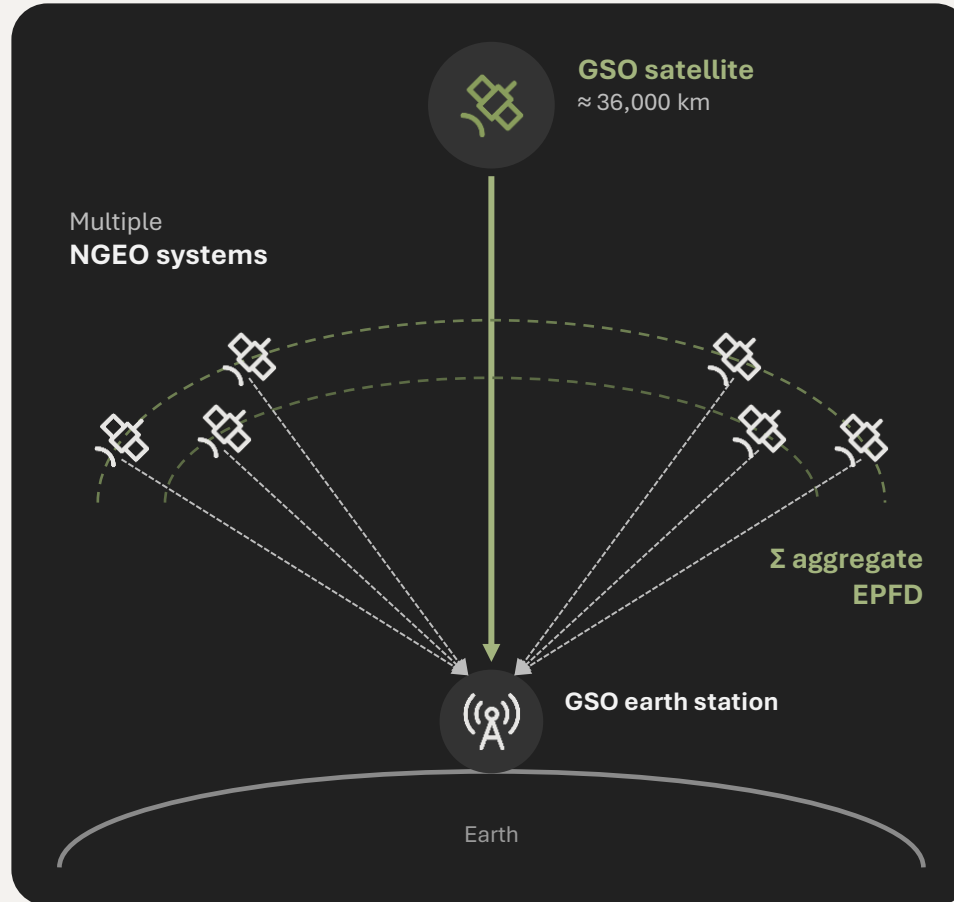


ASYMMETRIC RULES

Assess whether requirements should scale with system size: large vs. small systems.

NGEO–GSO coexistence: aggregate EPFD

RESPONSIBLE USE.
TECHNICAL
ASSESSMENT.
LONG-TERM VALUE.



Anatel takes part in ITU discussions and is advancing studies on how **different NGEO systems operating together** affect GSO systems.



PARTICIPATION IN ITU DISCUSSIONS

Active presence in ITU-R debates on NGEO–GSO coexistence and the shared use of spectrum and orbital resources.



AGGREGATE EPFD STUDIES

Assessing the combined interference (EPFD) from multiple NGEO systems into GSO networks — not just one system at a time.



CONTRIBUTING INTERNATIONALLY

Technical results, supported by an open-source EPFD simulation tool based on ITU methodologies, to inform international discussions.



Advancing space sustainability



INTERNAL WORK AT ANATEL

Cross-department efforts to analyze technical scenarios, trends and potential impacts related to non-GSO systems.



PARTNERSHIP WITH UNIVERSITIES IN BRAZIL

Technical studies and research projects to deepen our understanding and develop innovative solutions.



DIALOGUE WITH CST

Exchange of experiences with the CST team to evaluate the impact of large non-GSO constellations on GSO earth stations.



TOOLS AND SIMULATION INITIATIVES

Development of an open-source EPFD simulation tool based on ITU methodologies, supporting Brazilian technical studies for submission to the next ITU-R Working Party 4A meeting.



ACTIVE PARTICIPATION IN DISCUSSIONS

Contributing to national and international discussions on the sustainable use of spectrum and orbital resources.

Authorized satellites in Brazil

RESPONSIBLE USE.
TECHNICAL
ASSESSMENT.
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46

Authorized GEO satellites

27 satellite operators — all major global players.

14

Authorized NGE0 LEO systems (FSS/MSS)

Starlink, OneWeb, Kuiper (Amazon), Telesat Lightspeed, Orbcomm, Globalstar, Iridium, Kepler, EchoStar, Semaphore, Kinéis, Sateliot, Myriota.

15

Scientific NGE0 systems

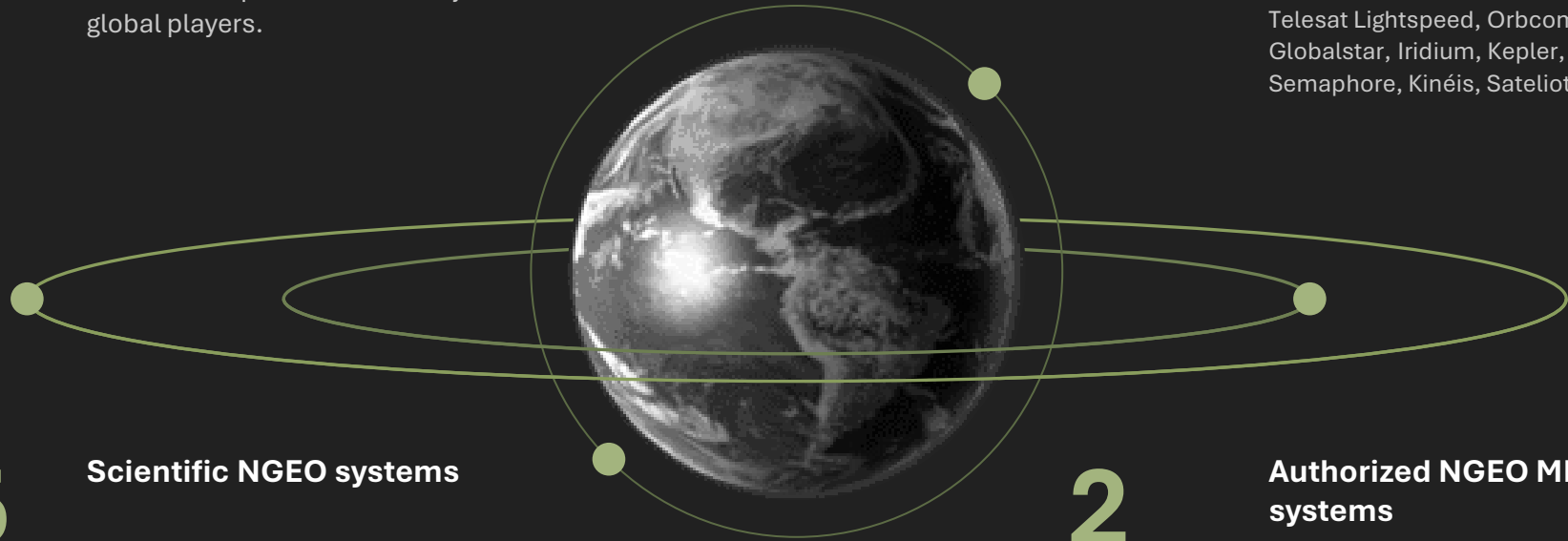
Including LEO cubesats.

2

Authorized NGE0 MEO systems

O3b (SES) and Omnispace.

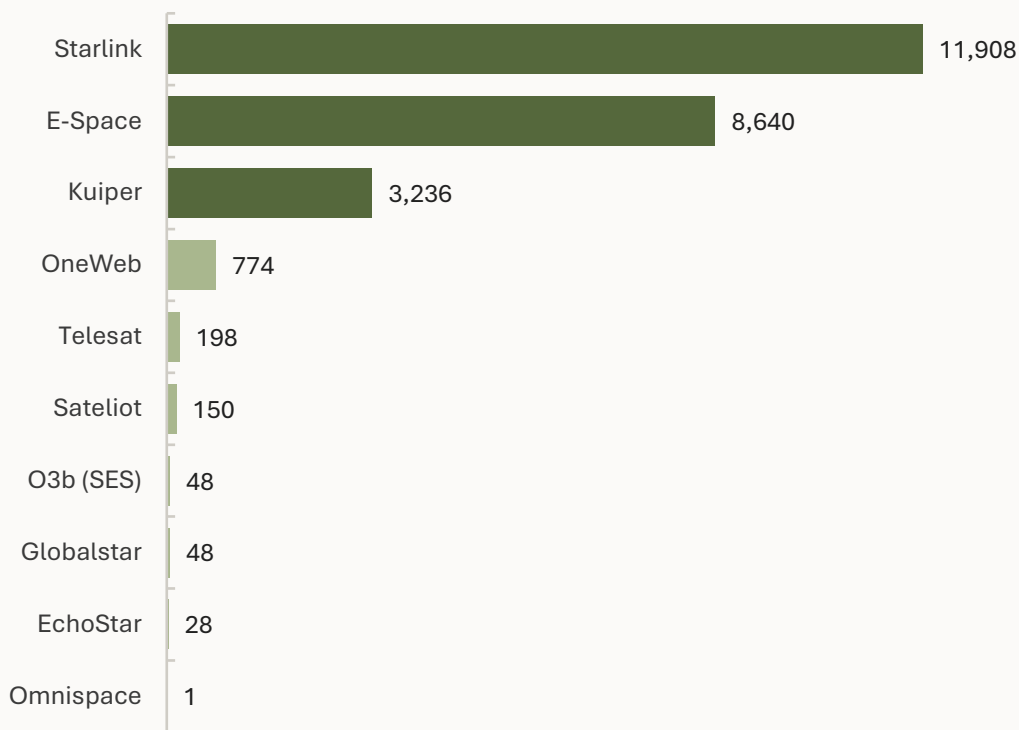
All commercial LEO and MEO systems are **foreign**.



Constellations authorized and in operation

RESPONSIBLE USE.
TECHNICAL
ASSESSMENT.
LONG-TERM VALUE.

Satellites per authorized N GEO system



GEO ≈ 36,000 km

Telesat, Telebras, Intelsat, Embratel, Inmarsat, SES, Hispamar and ViaSat

MEO 8,000 – 10,000 km

O3b (48 satellites) and Omnispace (1 satellite)

LEO 500 – 1,400 km

Starlink, E-Space, Satellite, Kuiper, EchoStar, Orbcomm, Iridium, OneWeb, Telesat and Globalstar



Shared international resources

Orbit and spectrum are managed by the ITU and belong to no country. Registering a network gives its Administration coordination priority — **not ownership of the resources.**



Space Sustainability Forum

THANK YOU!

Together, we build a more sustainable
and connected space future.



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