

Civil society / individual end-user engagement

Policy paper



Decolonizing the Internet

Global Governance of LEO Satellite Broadband

HOW DOES SATELLITE INTERNET WORK?

Broadband internet services provided by low earth orbit (LEO) satellite constellations have emerged as the solution to meet the increasing global demand for high-speed, low-latency connectivity.¹

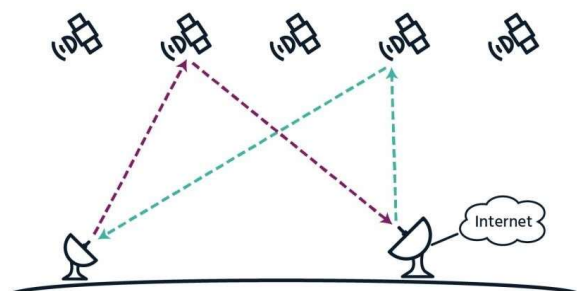


Fig. 1. LEO Satellite System Components (ISOC CC BY-NC-SA 4.0).²

With the growing use of fiber optic cable networks and cutting-edge mobile technologies, satellite communications have gained renewed significance for the world's internet infrastructure. Broadband connectivity is a crucial enabler for significant portions of today's social, economic, and governmental functions. Covid-19 recently brought attention to this link.³ Societies with and without access to meaningful connectivity both have a wide range of opportunities. The digital divide, as it is commonly known, widens the development gap over time. Time is of the essence when trying to solve this issue. **The quickest ways to bring connectivity to any location, including underserved regions of the**

world where it is most needed, are the LEO satellite constellations. Therefore, by facilitating broadband internet connectivity, they can help to reduce the negative effects of the digital divide if they are used effectively. The competing interests related to using this technology, which range from international issues like the digital divide, space sustainability, and global development to domestic issues with an international angle like cybersecurity, cybersovereignty, and data protection, may impede its use. If the promise of LEO satellite constellations is to be realized, these problems need to be solved with the help of important stakeholders.

WHY SHOULD YOU CARE?

The number of satellites deployed in low earth orbit has dramatically increased over the past ten years as a result of developments in satellite launch and manufacturing technologies as well as space communication technologies. These satellites, which are smaller than those placed in geostationary orbit, can be used for a variety of tasks, such as communication, earth exploration, space research, monitoring climate change, and national defense. In order to provide seamless global coverage, LEO satellite broadband technologies rely on multi-satellite fleets known as constellations.

National laws and regulations, international treaties, customs, and a wealth of multistakeholder policies on Internet governance are all included in an analysis of current international agreements covering the

¹ This policy paper includes sections from the complete project report by Berna Akcali Gur and Joanna Kulesza, "Decolonizing the Internet: Global Governance of LEO Satellite Broadband" Grant Request ID G20210704813, abbreviated and completed with actionable policy guidance for civil society and end-user audiences.

² ISOC, (2022). Perspectives on Leo Satellites. Using Low Earth Orbit Satellites for Internet Access. Available at:

<https://www.internetsociety.org/action-plan/2022/leos/>. Retrieved Feb. 9th, 2023.

³ ITU/UNESCO Broadband Commission for Sustainable Development (2022). 'The State of Broadband: Accelerating broadband for new realities'. Available at:<https://www.broadbandcommission.org/publication/state-of-broadband-2022>. Retrieved Feb. 8th, 2023.

deployment and use of LEO satellites for internet connectivity.

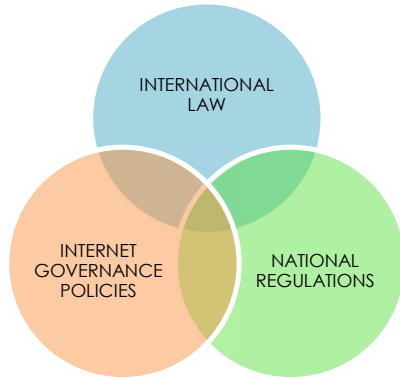


Fig. 2. Regulatory landscape of LEO broadband internet access.

The recognition of outer space as a global commons—a resource not owned by any one country but essential to the survival of all humankind—forms the basis of its international governance. Every country's space-related actions, including domestic regulations governing the deployment and use of commercial communication satellites, are expected to adhere to international law, and more specifically, international space law.⁴ The LEO satellite industry's use of space for commercial purposes is taking place within the context of this overarching legal framework. The goal of the international legal system was to protect space exploration and use for peaceful purposes. The sustainable use of space affects all states, not just those with current capabilities, and all nations have the potential to be spacefaring nations. Developing nations should advocate for their interests on pertinent international forums, ideally by forming alliances with other parties who share their concerns.

The frequency spectrum and orbital resources used by the LEO satellite constellations are limited natural resources that are managed by the ITU at the international level. The ITU performs this function in conformity with its mission "to promote, facilitate and foster affordable and universal access to telecommunication/ information and communication technology networks, services and applications and their use for social, economic and environmentally sustainable growth and development."⁵ Its multistakeholder membership model includes industry members, international organizations, and civil society, providing an

⁴ Johnson, C. D. (2018). The Outer Space Treaty. Oxford Research Encyclopedia of Planetary Science. Available at: <https://oxfordre.com/planetaryscience/display/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-43>. Retrieved Feb. 8th, 2023.

⁵ ITU (2018) 'Resolution 71: ITU Strategic Plan for 2020-2023'. Available at:

opportunity for civil society to promote their interests under its roof.

Most internet governance bodies, especially those that have a critical role in technical and standard-setting matters have a multistakeholder membership model. These organizations and other organizations that contribute to global internet governance related developments promote "a sustainable, people-centered and rights-based approach to the internet."⁶ It is best to ensure participation in these bodies to ensure that norms and policies developed in relation to satellite-based broadband conform to these values and principles.

HOW DOES LAW APPLY TO LEOs?

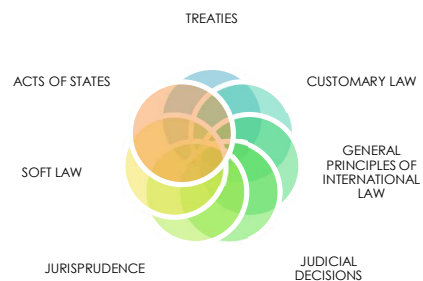


Fig. 3. Sources of international law applicable to LEOs.

Typically, LEO constellations are placed between 300 and 2000 kilometers from the planet. They are so close to Earth that a signal can be sent and received in a fraction of the time it takes for the GEO systems. Due to their similar characteristics, the satellites in LEO and MEO are both referred to as non-geostationary (NGSO) satellites. Their proximity enables them to provide high-speed, low-latency services, that work with terrestrial networks, and to enable applications that require real-time data transmissions, such as voice-over-internet protocol, Internet of Things and video conferencing.



Fig. 4 Earths orbits by altitude (© NASA R. Simmon)⁷

Low altitude, however, also entails a much smaller coverage area on Earth. Thus, whereas three satellites in GEO are sufficient to provide almost

https://www.itu.int/en/council/planning/Documents/ITU_Strategic_plan_2020-2023.pdf Retrieved Feb. 10th, 2023.

⁶ Council of Europe, 'Internet Governance' Available at: <https://rm.coe.int/leaflet-internet-governance-en-rev/1680909521>. Retrieved Feb. 20th, 2023.

⁷ NASA Earth Observatory, 'Catalog of Earth Satellite Orbits' available at <https://earthobservatory.nasa.gov/>

global coverage, much larger numbers of satellites are required to provide global coverage.

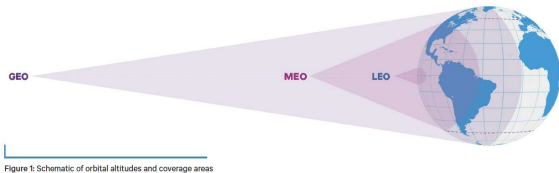


Figure 5 Schematic of orbital altitudes and coverage areas⁸

Figure 5 Orbital Altitudes and coverage areas⁸

So, "a number of similar satellites, of a similar type and function, designed to be in similar, complementary orbits for a shared purpose, under shared control," constitute satellite constellation systems.⁹ The ITU updated its rules in 2019 and added a definition of LEO satellite constellations as "non-GSO satellite systems having more than one orbital plane where the mutual relative position of each orbital plane and each satellite in its orbital plane is important." This was prompted by the emergence of one mega-constellation project after another. As a result, the numerous satellites in a constellation move in a planned and controlled manner along their predetermined path, with each satellite's location being crucial to the system's operation. Both from the ground and through satellite connections, coordination is made easier.

Internet access is becoming increasingly reliant on Low Earth Orbit satellite-based infrastructures. Commercial ventures like StarLink, OneWeb, Project Kuiper, and GW lead the new space race. The states that already dominate the core of critical internet infrastructures will extend their control in the next few decades, particularly in underserved regions.

CIVIL SOCIETY QUESTIONS ABOUT LEOS

- **ACCESS AS A HUMAN RIGHT:** Is LEO satellite-based service available in the country?
- **JURISDICTION** over service and infrastructure: Which national laws apply to LEO satellite-based service available in the country?
- **SECURITY:** How safe and reliable is the service?
- **DATA AND PRIVACY:** Which data is collected, how is it stored and who has access rights?

⁸ SES, (2020). 'GEO, MEO, AND LEO How orbital altitude impacts network performance in satellite data services'. Available at: <https://www.satellitetoday.com/wp-content/uploads/2021/02/Guide-GEO-MEO-LEO-1.pdf>. Retrieved Feb. 8th, 2023.

⁹ Lloyd Wood, (2003). 'Satellite Constellation Networks' in : Y. Zhang (ed) *Internetworking and Computing Over Satellite Networks*. Springer 13-34.

- **FAIR COMPETITION:** Which companies are providing the LEO satellite-based service? AND which authority oversees the services?
- **APPLICABLE LAWS:** Which laws and regulations must they comply with?
- **BUSINESS MODEL:** Is the service offered directly to individual users (e.g. Starlink) or as a part of a broader telecommunication services package (e.g. OneWeb)?
- **AFFORDABILITY:** How much does LEO satellite-broadband cost, and how will end-users pay?

WHERE TO GET INVOLVED?

Even though it may seem far off, emerging economies should become familiar with space law and invest in human capital and expertise given the convergence of civilian, military, commercial, and security interests in the space domain. It's crucial to pool resources through regional alliances. The recently founded regional space agencies demonstrate increased interest. The African Space Agency was established in 2023, and the Latin American and Caribbean Space Agency (LACA) was established in 2021. They may have smaller budgets and less ambitious goals than the space superpowers, but these steps are significant for promoting regional interests, aligning national interests, and developing expertise.

20 November to 15 December 2023 will see the ITU World Radiocommunication Conference (WRC-23) in Dubai, United Arab Emirates. Here is where the current rival LEO broadband strategies can be seen. The Radio Regulations, an international treaty governing the use of the radio-frequency spectrum and the orbits of geostationary and non-geostationary satellites, are reviewed and, if necessary, revised at the World Radiocommunication Conferences (WRC). The ITU Council's agenda, which incorporates suggestions from prior international radiocommunication conferences, serves as the basis for revisions.¹⁰ Internet Governance Forum and Internet Society are also developing policies and providing stakeholders a platform to deliberate on broadband services provided by LEO satellite constellations.¹¹ It is recommended to participate in these organizations to become better involved in up-to-date policy dialogues and to represent diverse interests of users from developing countries.

¹⁰ The ITU World Radiocommunication Conference 2023 (WRC-23) is to be held in Dubai, United Arab Emirates, 20 November to 15 December 2023. See more details here : <https://www.itu.int/wrc-23/>. Retrieved Feb. 8th, 2023.

¹¹ ISOC (2022) 'Perspectives on LEO Satellites' Available at: <https://www.internetsociety.org/resources/doc/2022/perspectives-on-leo-satellites/> Retrieved 1st Dec 2023.

Annex I: International laws and regulations on LEO satellite broadband

GENERAL INTERNATIONAL LAW **Treaties**

- UN 1962 Convention on Registration of Objects Launched into Outer Space [Registration Convention]
- UN 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies [Outer Space Treaty]
- UN 1972 Convention on International Liability for Damage caused by Space Objects [Liability Convention]

Secondary Sources of international law

- IADC 2002 Space Debris Mitigation Guidelines
- UNIDROIT 2012 Draft Protocol to the Convention on International Interests in Mobile Equipment on Matters specific to Space Assets
- UNOOSA / ITU 2015 Guidance on Space Object Registration and Frequency Management for Small and Very Small Satellites
- UN 2020 Committee on the Peaceful Uses of Outer Space Scientific and Technical Subcommittee, Revised Draft "Space2030" agenda and implementation plan

INTERNATIONAL ORGANIZATIONS **EU**

- EU 1985 Convention Establishing the European Telecommunications Satellite Organization [EUTELSAT]
- EU 2018 DIRECTIVE 2018/1972 establishing the European Electronic Communications Code
- EU 2021 Starlink EU/UK/EEA Privacy Policy

ITU

- ITU 1992 Constitution of the International Telecommunication Union

- ITU 2002 Telecommunications Convention
- ITU 2019 World Radiocommunication Conference (WRC-19) Final Acts
- ITU 2020 Radio Regulations
- ITU 2021 GSR-21 Best Practice Guidelines
- ITU 2023 World Radiocommunication Conference, Radio Regulations review

WTO

- WTO 1994 General Agreement on Trade in Services (GATS)
- WTO 1994 GATS Annex on Telecommunications
- WTO 1994 Fourth Protocol to the General Agreement on Trade and Services

ESA

- ESA 1980 Convention of the European Space Agency and Rules of Procedure of the ESA Council
- ESA 2014 Space Debris Mitigation Policy for Agency Projects
- ESA 2014 Space Debris Mitigation and Re-entry Safety Regulatory Framework
- ISO 2019 ISO 24113: Space debris mitigation requirements

To access full database of relevant international law documents, treaties, regulations as well as soft law sources, private law contracts and other policy documents, visit the project website at: www.cyber.uni.lodz.pl/LEOs
