What We Owe Each Other: Equitable Access to Secure, Affordable, and Reliable LEO Broadband Satellite Services - A development perspective

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Introduction:

The Low Earth Orbit (LEO) satellite constellations have the potential to play a critical role in the global connectivity ecosystem. The prospect of the availability of secure and reliable low-latency broadband data services anywhere on the planet spark hope, especially in places where developmental goals have been hindered due to a lack of meaningful connectivity. In the face of the persistent development gap, nations have recognized the significance of communication for progress, most notably in the context of UN sustainable development goals (SDGs).[2] The right policy choices supported by appropriate normative frameworks at the international and domestic levels will be critical to ensure that these new orbital infrastructures are utilized where they are most needed. The policy choices underlying the norms and principles are best determined at the international level, given the global nature of the issue and the associated problems. Primarily the global inequality arises from the necessity for technological prowess and the capital-intensive nature of these projects. These infrastructures will be owned and operated by private enterprises that are established by or in a few spacefaring nations. Reliance by other nations on them for sustainable broadband access requires balancing competing interests among a wide range of stakeholders and an agreement on fundamental governing principles at the international level. This article proposes the equitable access principle to guide the interpretation of existing norms and the development of new norms in regulating the fair use of this new form of broadband connectivity if it is to fulfil its promise to enhance global development.

Space-based communication systems are subject to outer space law and international telecommunications law. In both disciplines, the principle of equitable access has been linked to the

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[2] The United Nations established the Sustainable Development Goals (SDGs) in 2015 as a universal call to action to eradicate poverty, safeguard the environment, and guarantee that by 2030 all people live in peace and prosperity. The 17 Sustainable Development Goals (SDGs) sit at its core, and they represent an immediate call to action by all nations, both developed and developing, in a multilateral framework. They acknowledge that eradicating economic inequality or other forms of exploitation must be merged with strategies that enhance healthcare and education, eliminate poverty, and encourage economic growth – all while addressing climate change and attempting to safeguard our oceans and forests. See: UNGA A/RES/70/1, 2015.

common recognition of space as global commons. The Outer Space Treaty (OST) starts with this acknowledgement in Article 1, under which the nations have agreed that the exploration and use of outer space *shall be carried out for the benefit and in the interests of all countries and shall be the province of all mankind*. Building on this agreement and recognizing that the Earth's orbits are limited natural resources, its commercial and governmental use has been coordinated at the international level, primarily relying on notification and registration requirements. [3] Starting from the 1970s, the non-space-faring nations have been concerned about whether the system in place would eventually leave them with no availability - especially in the geo-orbit - once they have reached technological and economic development to become spacefaring nations themselves.[4] At the time, adjustments were made to the regulations governing the use of geostationary orbit based on the equitable access principle, and the International Telecommunication Union (ITU), the United Nations specialized agency for information and communication technologies (ICTs) assumed the central role.[5] However, the mega-constellations pose risks beyond equitable access to space and equitable use of orbital space. There are urgent and critical space sustainability concerns about the exponential increase in the number of satellites in LEO. Hence, a comprehensive solution will likely be beyond the ITU's mandate, but it will continue to play a critical role. The equitable access principle in international telecommunications law and outer space law must be re-assessed and applied in a way that does not impinge upon space sustainability and yet protect all nations' interests, primarily their right to benefit from the use of space resources. The use of existing processes and the framework of formal requirements about how these rules are made, interpreted, and applied will ensure their legitimacy.

In the context of satellite broadband services, the policies that prevail globally will directly impact the much-debated right to internet access and the future-oriented Internet governance agenda.[6] In a bipolar scenario dominated by business from the Global North, developing nations will have little chance to participate in the evolution of norms and principles fully and meaningfully unless effective and targeted intervention at the international level is ensured. In that context, whether and to what extent the experiences from implementing the multistakeholder model might be suitable to new challenges posed by LEO satellite constellations need to be reviewed. Main criteria would be a review of the original WSIS promise of the multistakeholder model to assess whether it is still best suited to manage critical internet infrastructures. These future-oriented bottom-up policy developments through the universal participation of governments, businesses and civil society in their respective roles have produced a set of comprehensive, practical guidelines, whereas their implementation at times lags behind. The transparency and inclusiveness of this model have also been questioned.[7] Consolidated under the Internet Governance Forum, the emphasis has recently prioritized ensuring that 'the benefits of information and communications technologies, including new technologies, are

[3] Article 44.2 (196), ITU Constitution of 1982

[4] Tyler A. Way, (2018) 'The Space Gap, Access to Technology, and the Perpetuation of Poverty,' International ResearchScape Journal: Vol. 5, Article 7

[5] Eric D. Altholz, 'WARC 1985: The Effects of an Equitable Access Regime on Satellite Telecommunications Services' (1986) 1 University of Chicago Legal Forum 10

[6] See e.g.: Paul De Hert, Dariusz Kloza, 'Internet (access) as a new fundamental right. Inflating the current rights framework?', European Journal of Law and Technology, Vol. 3. No. 3, 2012

[7] See e.g. Kathryn A. Kleiman, 'Crash Goes ICANN's Multistakeholder Model.' *Am. U. Intell. Prop. Brief* 11 (2020); Milton L., Mueller, and Farzaneh Badiei. 'Requiem for a dream: on advancing human rights via internet architecture.' *Policy & Internet* 11.1 (2019): 61-83

available to all, … and striving to provide universal and affordable access…".[8] These documents should guide the global policies regarding the provision of LEO broadband satellite services, especially concerning their role in the global digital divide and their potential to mitigate or exacerbate related concerns. The lessons learnt from the development and implementation of the multistakeholder model and policies produced thereunder should be used to better the processes for LEO satellite contellations' governance.

The current space sustainability concerns suggest that increasing the number of satellite constellations is not a desirable solution to ensure equitable access to orbital resources. Significant problems arise in relation to space traffic management, space debris and astronomical observation. The sharing of limited resources and conservation of global commons is ideally conducted to maximize human well-being. Besides, it is not an option for most nations to compete in the space race, as they are behind in technological development and economic prosperity.[9] Purely from a connectivity perspective, there is not enough evidence as to the capacity or number of constellations needed.[10] At this stage, the commitment to equitable access to orbital resources can be realized partially by benefit sharing from the use of these resources, primarily equitable access to broadband services. The conditions of equitable access should be based on the already established principles of internet governance and comply with the telecommunications laws and regulations at the domestic and international levels. Any other scenario would prove unfeasible in the face of efforts needed to alter existing normative and standardization arrangements. Space-based telecommunication services started with (hybrid) international organizations creating global systems in the public interest.[11] The authors argue that given the commercial nature of satellite broadband services, security, reliability, and affordability emerge as the underlying criteria of equitable access and benefit sharing.

The article continues in Section 2 with an analysis of the potential impact of LEO satellite broadband for sustainable development, considering the current global connectivity landscape. In Section 3, an assessment of how the equitable access principle had been interpreted in the context of space law will be conducted. This section critically analyses the new space race to deploy mega-constellations in LEO for broadband services. Section 4 extends the analysis to international telecommunications law. The application of the principle will be interpreted in the context of ITU instruments considering the latest developments. The fifth section adds the multistakeholder internet governance perspective to the analysis focusing on geo-political tensions. This assessment reveals the recommended features of equitable access to LEO satellite broadband and their bearing on global internet governance. The significance of connectivity for sustainable development is the common theme that underlies this research. Section 6 concludes.

The paper relies on a dedicated mixed methodology that compiles 1) desk research of legal and policy documents with 2) a political science perspective on sustainable development and 3) a dedicated technological approach to policy development for LEO based internet access. Initial comparative desk research has been combined with a series of structured intervies with leading scholars and practioners in the field. This cumulative effort has been complemented by a global survey among internet users

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[8] UNGA, 'Information and communications technologies for sustainable development' Report of the Second Committee 5 December 2019 A/74/378

[9] Saadia M. Pekkanen, 'Governing the New Space Race' (2019) 113 AJIL Unbound 92

[10] See e.g. Jeremy E. Allnutt, and Timothy Pratt. *Satellite communications*. John Wiley & Sons, 2019, 9-11

[11] Francis Lyall and Paul B. Larsen, Space Law A Treatise, 2018 Routledge 2nd Ed. 281

addressed through ISOC chapters, who shared their views on priorities for the further development and implementation of LEO based connectivity. These observations have been assessed against the background of legal documents relating to sustainable development goals, international human rights law, outer space and telecommunication regulations within and beyond the ITU as well as examples of leading local business practise. Based on this mix of research methods and resources a proposal for a sustainable development approach for any future regulatory or normative approach to LEO based internet access has been made.

II. LEO Satellite Constellations and Sustainable Development Goals

Universal and meaningful digital connectivity plays a crucial role in achieving the SDGs, and it has become ingrained with contemporary social, economic, and governmental functions.[12] In recognition of its enabling role for all 17 SDGs, connectivity has been referred to as SDG Zero.[13] Recently, Covid-19 has highlighted this link.[14] The regions that have achieved digital transformation have adapted to the challenging circumstances caused by the global pandemic much quicker than those on the other side of the digital divide. This catastrophic period further expanded the development divide and amplified the significance of connectivity as a public utility. The efforts to bridge the digital divide are well justified. The most challenging step ahead is possibly rolling out the digital infrastructure to enable a fast and reliable connection.[15] The mega-constellation projects in LEO require minimal terrestrial infrastructure to offer universal broadband services in a new region or to complement their existing networks comprising wireless, wired, and other satellite technologies. They are deployed in large numbers to achieve availability, reliability, and global coverage.[16] Therefore, their emergence has been met with enthusiasm in the context of their potential contribution to global development.[17]

II.1. Leo Satellite Constellations

Space technologies have been a complementary part of global communication infrastructures. Most often, they have provided last-mile solutions in remote and sparsely populated areas that are not easily served by terrestrial networks and to mobile users, such as ships and planes. Large LEO satellite constellations have recently emerged to respond to the ever-growing broadband connectivity

[12] UNDP, '*The catalytic role of digital connectivity*' Singapore Global Centre Blog 8 November 2020 <https://www.undp.org/sgtechcentre/blog/catalytic-role-digital-connectivity>

[13] Jimena Leiva Roesch, *SDG Zero? A People-Centered Approach to Universal Connectivity* (2021) International Peace Institute

[14] The Broadband Commission for Sustainable Development, 'The State of Broadband: Accelerating broadband

for new realities', 2022

[15] ITU and UN Office of the Secretary General's Envoy on Technology, 'Achieving universal and meaningful digital connectivity: Setting a baseline and targets for 2030' (2022) available at <https://www.itu.int/itu-d/meetings/statistics/wpcontent/uploads/sites/8/2022/04/UniversalMeaningfulDigitalConnectivityTargets2030_BackgroundPaper.pdf> accessed on 9 October 2022

[16] S. Liu et al., 'LEO Satellite Constellations for 5G and Beyond: How Will They Reshape Vertical Domains?,' in *IEEE Communications Magazine*, vol. 59, no. 7, pp. 30-36

[17] See e.g. Steve Mirmina and Caryn Schenewerk, International Space Law and Space Laws of the United States, Edward Elgar Publishing 2022, 124 ff.

demand. For most social, economic, and governmental functions, the use of applications enabled by low latency, high-bandwidth connectivity has become essential. LEO satellite constellations have the potential to provide this much-needed capacity. Earlier constellations in LEO emerged in the 1990s, such as Orbcom, Iridium and Globalstar. These consisted of a smaller number of satellites and provided speech and narrow-band data.[18] Advances in communications and space technologies, dramatic reductions in launch costs and financing by the technology sector drove the second wave of LEO satellite constellation ventures. These are more ambitious projects with an increased number of satellites. Some leading examples are 42,000 satellites planned by US venture Starlink, 13,000 satellites planned by the Chinese venture GW, and 648 for UK and India venture OneWeb.[19]

The typical architecture of these systems consists of three main components: the constellation of satellites in LEO, a network of ground stations, and user terminals. The shorter distance from Earth to LEO enables high speed and low latency. As each satellite flies over an area, another one follows behind to facilitate the continuity of communication. The ground stations act as a gateway to the Internet and/or private networks connect the system thereto, requiring good fibre connectivity. Communications satellites need to simultaneously see both the ground station and the user terminal to connect the user to the Internet or a private network in real-time. At the time of this article, the distance between ground stations is required not to exceed about a thousand kilometres in providing continuous coverage. The emerging laser communication system between satellites is expected to reduce the system's dependence on the geographical location of ground stations. Increasingly, the location of ground stations is coordinated with cloud entry points. This facilitates faster downlinking of imagery and other data and better communication network management. Cloud service providers also benefit from satellite connectivity for their services.[20] The third component is the user terminal, by which the users connect their devices to satellite broadband services. These are provided by the satellite company operating the system. Additionally, satellites need spectrum, a limited natural resource, as they communicate with the Earth through radio waves. Therefore, the LEO satellites constellation will need the authorization to use spectrum in each jurisdiction to provide broadband services. The stability of spectrum allocations in the long term is a central concern for the satellite industry.[21]

[18] Tom Butash, Peter Garland and Barry Evans, 'Non-geostationary satellite orbit communications satellite constellations history' (2021) 39 International Journal of Satellite Communication Network 1.

[19] Andrew Jones, 'China is developing plans for a 13,000-satellite megaconstellation' (2021) *Space News* https://spacenews.com/china-is-developing-plans-for-a-13000-satellite-communications-megaconstellation/ accessed on 10 October 2022.

[20] Ofcom, 'Technology Futures Spotlight on the technologies shaping communications for the future' (2021) https://www.ofcom.org.uk/__data/assets/pdf_file/0011/211115/report-emerging-technologies.pdf

[21] See e.g. European Commission, Digital Transformation Monitor - Low-Earth Orbit satellites: Spectrum access, Brussels 2017

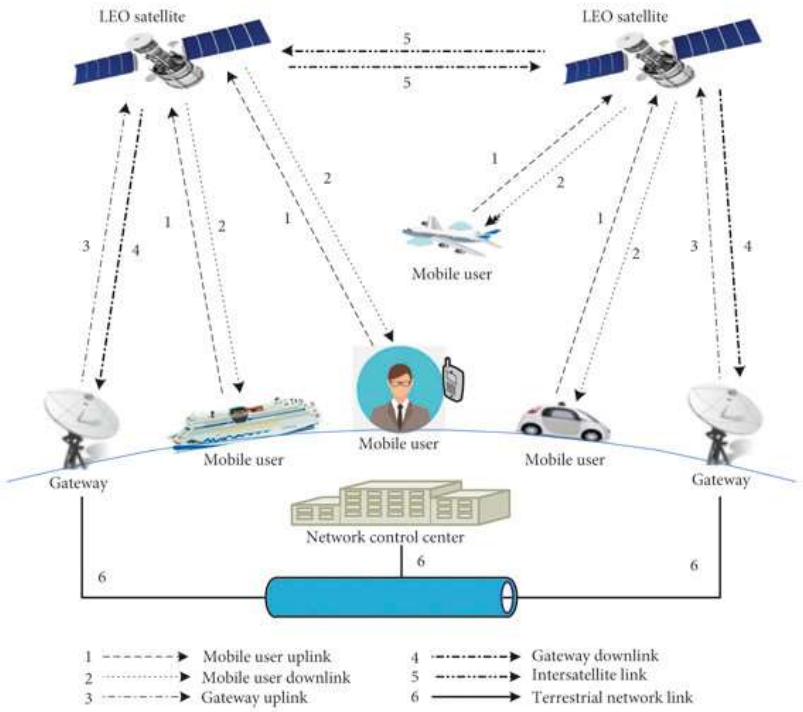

Fig. 1 A low Earth orbit satellite communications system.[22]

LEO satellite constellations are still in their early stages of deployment. There are different business models offered by the early entrants to the market. SpaceX has prioritized the direct-to-consumer model, whereas One Web has prioritized business-to-business and has been forming partnerships with incumbent telecom operators to provide backhaul connectivity for wireless communications and network redundancy to back up global submarine cable communications. Some others, such as SES and Viasat, are exploring multi-orbit solutions to enhance agility, performance, and resilience. The role of LEO satellite technology in the global communications industry has not yet matured. They will become a complementary piece of the larger global communications network in any scenario rather than replace existing cabel and wireless infrsastructures. It is particularly for this reason states must make sure that the seemles integration of LEOs into the global internet infrastrutures networks successfully addressed sustainable development concerns.

II.2. Meaningful Connectivity and LEO Satellite Broadband

The Broadband Commission has recently defined the meaningful connectivity concept for Sustainable Development as *the possibility for everyone to enjoy a safe, satisfying, enriching, productive and affordable online experience.*[23] It complements the universality goal, which is connectivity for all.

[22] Graphic by: Huang, Huihui & Miao, Xuyang & Wu, Zehui & Wei, Qiang. (2021). An Efficient ECC-Based Authentication Scheme against Clock Asynchronous for Spatial Information Network. Mathematical Problems in Engineering. 2021. 1-14. © CC BY 4.0

[23] The Broadband Commission for Sustainable Development, '*Manifesto: Global Goal of Universal Connectivity*' (2020)

Infrastructure, access to and affordability of mobile and/or fixed devices, digital skills, connection security and navigation safety, enable universal and meaningful connectivity. The desired speed for broadband access has been a moving target, increasing with advancements in communication technologies. Most recently, 5th generation mobile technology (5G) has been described as *'one of the most important innovations of our time' and 'the future backbone of our increasingly digitalized societies.*[24] Together with fibre optic broadband, a network of fibre optic cables that deliver high-speed data over long distances, 5G is expected to constitute the central infrastructure of the global Internet and enable substantial segments of the global digital economy. This digital transformation is expected to facilitate the shift to a new phase in production, consumption, transportation, and delivery systems, which is referred to as the Fourth Industrial Revolution.[25] The required investment in underlying technologies, including 5G, is immense, and it is not within reach in vast parts of the world. So, these advancements, if not managed according to the SDG agenda, hold the potential risk to broaden the global digital divide, making it more difficult for the developing world to keep up with fast-moving markets and facilitate social and economic development.[26] Integrating LEO satellites with terrestrial mobile networks has been considered a promising solution to this problem, primarily because most of the population in low- and middle-income countries are expected to continue connecting to broadband mainly through their phones.[27] The low altitude of LEO satellites allows them to meet the latency requirements of the 5G applications, unlike the satellites in higher altitudes which require the signal to travel longer distances.[28] Access to high-speed, low-latency, reliable broadband connectivity through minimal terrestrial infrastructure requirements is an ideal scenario for all regions that have been deprived of universal and meaningful access.

[24] Marco Lourenço and Louis Marinos *ENISA Threat Landscape for 5G Networks*, European Union Agency for Cybersecurity, 2019

[25] Klaus Schwab, 'The Fourth Industrial Revolution: What It Means and How to Respond' (2015) Foreign Affairs <https://www.foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution> accessed 6 July 2022

[26] Barbara Lippert, Nicolai von Ondarza, Volker Perthes (eds), 'European strategic autonomy: actors, issues, conflicts of interests' (2019) Stiftung Wissenschaft und Politik Research Paper 4

[27] Jessica Clement, 'Mobile internet traffic as percentage of total web traffic 2021' (2021) *Statista* https://www.statista.com/aboutus/our-research-commitment/408/j-clement accessed on 10 October 2022

[28] Shicong Liu, Zhen Gao, Yongpeng Wu, Derrick Wing Kwan Ng, Xiqi Gao, and Kat-Kit Wong, 'LEO Satellite Constellations for 5G and Beyond: How Will It Reshape Vertical Domains?' (2021) 59 IEEE Communications Magazine 30

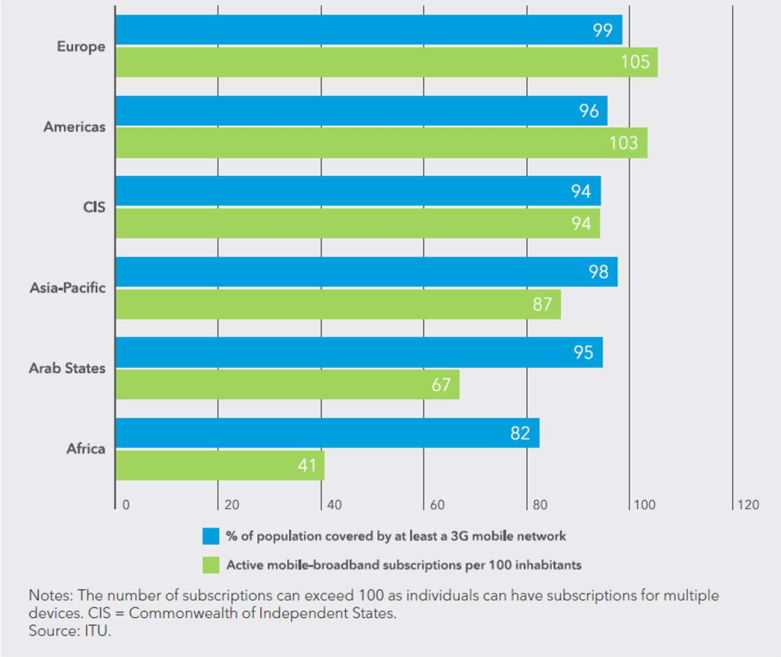

Fig. 2 Mobile broadband coverage and subscriptions (2021). Source: ITU (CC-BY-NC-SA)[29]

There is no connectivity without infrastructure. However, infrastructure is not the only enabler. People also need devices that will facilitate access. If LEO satellite companies provide services directly to consumers, they will also need user terminals to connect their devices. If they are used to support the existing infrastructure, this issue will be resolved between the local internet service provider and the operator of the LEO satellite constellation. In any scenario, the cost of the Internet-enabled devices as well as that of equipment required to facilitate satellite broadband access together with applicable subscription fees will all impact the affordability of services and devices. This is another binding constraint to meaningful access.[30] The business model of these new ventures, their financial viability must be balanced against affordability if they are to play a positive role in enhancing global development.[31] Safety denotes the protection of users from possible threats they could encounter online, mainly through awareness, education, information and technology. The following sections will consider affordability as a key catalyst of LEO satellite broadband connectivity for development.

II.3. LEO Satellite Broadband: Regulatory Limitations and Concerns

It is the sovereign right of states to regulate the provision of telecommunication services. National regulation of frequency spectrum and the associated licensing procedures within their territories to meet national policy objectives lie within the exclusive authority of weach state. It is in the state's

[29] ITU, Global Connectivity Report 2022,15

[30] John Garrity and Aminata Amadou Garba, *The Last-mile Internet Connectivity Solutions Guide: Sustainable Connectivity Options for Unconnected Sites* (2020) International Telecommunication Union p 8.

[31] Even after these benchmarks are met, digital skills, sometimes called digital literacy and safety, come into the picture as a barrier for a population to benefit from connectivity. Digital skills refer to *a range of abilities to use digital devices, communication applications, and networks to access and manage information, see:* UNESCO, 'Digital skills for Online inclusion https://en.unesco.org/news/digital-skills-critical-jobs-and-social-inclusion. The connectivity constraints related to digital skills and safety are beyond the scope of this paper.

interest to have access to a global infrastructure that offers universal broadband services and facilitates their digital transformation. However, it is also reasonable that they would like to integrate this new service model into their existing infrastructure by going through their existing control mechanisms. So, LEO satellite companies must comply with domestic laws and regulations to obtain rights to set up ground stations, sell user terminals to consumers and provide broadband internet services, depending on their business model. The requirements change if they seek to be authorized as direct-to-end user service providers or in partnership with incumbent telecom service providers. The assignment of the radio-frequency spectrum is also a matter of state sovereignty, although there is coordination at international level.[32] The satellite service provider will also have to obtain authorization for their use of frequency spectrum, which often requires a reimbursement, sometimes determined through auctions. There may be other market access barriers, such as taxation, additional licensing, and authorization requirements, depending on the policy preferences of each jurisdiction. These directly impact the accessibility and affordability of LEO based internet access.

In addition, states have been increasingly concerned about cybersecurity of infrastrucutrres and networks they rely on. The integration of LEO based infrastructures into the global communication networks will expose this new infrastructure component to the present cyber threat landscape. The mega constellations reportedly have cyber vulnerabilities specific to their technologies and how they function.[33] As such, the cyber threat landscape is likely to expand because of increased reliance on them. The cybersecurity risks that are associated with the use of these systems have a variety of implications at national, regional, and global levels.[34] So, the norms and policies developed to address the cybersecurity concerns in the telecommunication networks may apply to the LEO satellite broadband yet require adjustments specific to a given business model or network design. The persistence of cybersecurity-related concerns will likely hinder cross-border market access and, so, the effective use of this technology and its potential developmental benefits. China and Russia have already raised this concern when announcing that Starlink's services will not be authorized within their borders.[35] The EU has also raised security-related concerns in justifying its endeavour to deploy a European LEO satellite constellation.[36]

Given the inherently international nature of space technologies and the significance of satellite communications to terrestrial infrastructure and linked services, cybersecurity concerns are shared among all nations that benefit from their use. The approach adopted by major powers suggests that commercial enterprises providing LEO broadband services will be subject to scrutiny concerning their cybersecurity.

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[32] Within the ITU mandate applicable through its Radiocommunication Sector (ITU-R), and the Radiocommunication Bureau (BR). See: ITU RESOLUTION 804 (REV.WRC-19), Principles for establishing agendas for world radiocommunication conferences.

[33] *David Livingstone and Patricia Lewis, 'Space, the Final Frontier for Cybersecurity?' (2016) Chatham House Research Paper, International Security Department*

[34] *Madelyn R Creedon, 'Space and Cyber: Shared Challenges, Shared Opportunities'*

[35] See e.g. Evelyn Cheng, Musk says Beijing doesn't want him to sell Starlink in China, CNBC, Oct 10, 2022, accessed Oct. 29th 2022 at <https://www.cnbc.com/2022/10/10/musk-says-beijing-doesnt-want-him-to-sell-starlink-in-china-ft-report.html>

[36] EPRS, EU secure connectivity programme, Building a multi-orbital satellite constellation, 2022, available at:

III. Equitable access principle in Outer Space Law and the New Space Race

Activities relating to outer space are governed by space law, the body of international legal norms developed primarily under the auspices of the United Nations General Assembly and its Committee on the Peaceful Uses of Outer Space (UNOOSA). The creation of the main body of space law, consisting of five treaties, had been prompted by the space race in the Cold War between the USA and the former Soviet Union. The underlying objective of the treaties was to facilitate cooperation, ensure the use of space for peaceful purposes, and moderate the proliferation of the space race among the two spacefaring nations. Accordingly, space has been recognized as global commons, free for peaceful exploration and use by all states based on equality and no claims of sovereignty may be made.[37] The deployment of satellites over the years by an increasing number of states has been based on the understanding that orbits are free for use. Commercial enterprises and states rely on this principle for their LEO broadband constellations. As the number of these projects increases, frequently referred to as the new space race, their excessive size and potential risks raise concerns about the viability of the treaty provisions in force. Although there may be truth to this concern, negotiations of multilateral agreements are usually lengthy, and new space ventures have picked up the pace. Hence, time is of the essence to resolve urgent problems and updating or replacing existing multilateral commitments seems unfeasible.[38] The equitable access principle on the other hand offers a reasonable starting point of reference to balance the commercial interests and other competing global (and national) interests, principally sustainable use of orbital resources and sustainable development of nations.

III.1. Equitable Access to Space and Space Resources

According to the first paragraph of OST Article I , space is the province of all mankind. Its use shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development. This first paragraph provides the limit of freedom of use and exploration, imposing a responsibility to consider the interests of other states, whether spacefaring or not.[39] There are conflicting national interpretations regarding how this provision applies, considering the significant discrepancy between spacefaring states' technological and economic capacity to invest and engage in space-based activities and others.[40] More specifically, what do the spacefaring nations 'owe' to others? To what extent should they share the benefits accrued from their investments in space technologies and their applications? The growing involvement of commercial actors in space activities, some of which are multi-national, complicates matters further. In practice, the accessibility of particular space technology or resource by nations other than the one that has generated it has been the most common way of benefit sharing. Most recently, the UN's Space 2030 Agenda corroborates this understanding. In an endeavour to facilitate the use of space technologies for development, the documents set forth action items that seek to balance commercial and noncommercial interests,

[37] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 27 January 1967, 610 UNTS 205 [Outer Space Treaty, OST] Article II

[38] See e.g. Madelyn R Creedon, 'Space and Cyber: Shared Challenges, Shared Opportunities', and Jan Kallberg, 'Designer Satellite Collisions from Covert Cyber War', both in (2012) Strategic Studies Quarterly, 1, 123

[39] Jakhu Ram Sarup. Implementing Global Public Interest in Information Society. In: Revue Québécoise de droit international, volume 18-1, 2005, pp. 171-184

[40] See generally T.M. Scanlon, op.cit.; Julian, Lamont (ed.), Distributive justice. Routledge, 2017

including the interests of future generations, given the current gap between spacefaring nations and others.[41]

The UN document seeks to aid developing countries in understanding and developing space technologies and to benefit from and utilize existing ones owned and operated by others. The right to equal access to space is hindered by differences among states in their current capacity to do so. The nations that can do so, build on years of expertise and invest vast sums in research, development and operationalization of these technologies. They would, understandably, like to reap the benefits from these endeavours. For example, the US, the global leader in space technologies, has recently adopted legislation allowing its citizens to establish property rights over asteroid resources or other space resources in a manner compatible with the US's international obligations, despite such provision holding no legal effect as per the Article VI OST.[42] On the other hand, the present and future benefits are only possible due to the utilization of common resources. Some of these are limited, such as orbits and may be depletable, such as some off-Earth mines. The development gap is likely to expand further due to a few nations' exploitations of these resources.

All in all, the unconstrained freedom to use common resources has the potential to result in the abuse of rights or a *self-defeating scramble for too little by too many.*[43] To counter the negative consequences, policies are developed and renewed to attain a fairer allocation.[44] Equitable access to space resources by developing nations is a principle adopted to pursue fairness. Its legal basis can be traced back to OST Article I, which requires the states to observe the needs of developing nations and to OST Article IX about space sustainability. Corresponding ambitions are reflected in subsequent UNGA resolutions, including the Vienna Declaration on Space and Human Development and other UN initiatives, such as the Space 2030 Agenda, discussed herein below.[45]

The route to fairness and its substance changes in parallel with social context and time.[46] Therefore, policies need to be adapted to current dynamics and an altered view of the future. The new space race is different from the original, particularly regarding the number of actors involved and the prevalence of commercial interests. Indeed, the original five treaties recognize states as the primary actors in space activities. The states bear international responsibility for all activities in space conducted by their public or private entities.[47] The states are also responsible for registering the space

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[41] UNGA, The "Space2030' Agenda: space as a driver of sustainable development, A/RES/76/3, 28 October 2021

[42] Title IV, 3(a) US Commercial Space Launch Competitiveness Act (CSLCA)

[43] Thomas M., Franck, 'Fairness and International Law: An Analytical Framework', Fairness in International Law and Institutions (Oxford, 1998; online edn, Oxford Academic, 22 Mar. 2012)

[44] *ibid*. Peter Martinez, A/AC.105/2018/CRP.20 Conference Room Paper by the Chair of the Working Group on the Long-Term Sustainability of Outer Space Activities (27 June 2018), p. 2

[45] The Space Millennium: Vienna Declaration on Space and Human Development title. A/CONF.184/6-UN, chap. I, resolution 1.

[46] Franck, Thomas M., 'Fairness and International Law: An Analytical Framework', Fairness in International Law and Institutions (Oxford, 1998; online edn, Oxford Academic, 22 Mar. 2012)

[47] Article VI and VII Outer Space Treaty, Convention on International Liability for Damage Caused by Space Objects, 29 March 1972, 961 UNTS 187 [Liability Convention] art II (entered into force 1 September 1972);

objects they launch or procure the launch of and supervising and ensuring these activities' compliance with the OST.[48] Registration, liability and supervision requirements of spacefaring nations are no longer adequate to ensure the interests of others.[49] Moreover, over time, space activities have become a multi-state effort leading to a complex regime of liability, responsibility and jurisdiction, and the states have concluded agreements amongst themselves to decide the scope of the responsibility each bear under international law. The emerging technologies, including LEO broadband satellites, highlight disparities in space governance.

III:2. Space Law and Equitable Access to LEO Broadband Satellite Constellations

In a scenario where all nations had the capacity to develop their own LEO broadband constellations and deploy their own, the result would be disastrous. Even with a handful of projects underway, the planned number of satellites, their brief life span and their frequent de-orbits are expected to cause a significant increase in space debris.[50] Space traffic has become more difficult to manage, more collisions are anticipated, and the space environment is becoming more prone to collisional cascading.[51] Such a catastrophe will render not only LEO but almost all space resources inaccessible for all, having ruined the first layer of space between Earth and beyond. So, one constellation per nation is neither feasible nor is it desirable. However, broadband access for all is necessary, given its inherent link with development. In the context of global LEO satellite broadband governance, the most urgent problem that needs to be addressed is prioritizing space sustainability while facilitating the availability of LEO satellite broadband technology for all on an equitable basis.[52]

The operational telecommunication satellite services are available across borders. As a matter of fact, most services provided by satellites, owned publicly and privately, are utilized by an increasing number of nations. Over the years, the UN has reiterated its intention to support the equitable utilization of orbital resources and universal access to space-based communication services by making satellite communications available as soon as practicable on a global and non-discriminatory basis.[53] These

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Convention on Registration of Objects Launched into Outer Space, 14 January 1975, 1023 UNTS 15 [Registration Convention] art II (entered into force 15 September 1976).

[48] The Space Millennium: Vienna Declaration on Space and Human Development (adopted by the Conference at its 10th plenary meeting, on 30 July 1999, Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), held in Vienna from 19 to 30 July 1999

[49] Alexander P. Reinert, Updating the Liability Regime in Outer Space: Why Spacefaring Companies Should Be Internationally Liable For Their Space, William & Mary Law Review ,Volume 62 (2020-2021), Issue 1, Article 7, 10-2020

[50] OECD, *Earth's Orbits at Risk: The Economic of Space Sustainability* (2022) OECD Publishing

[51] B. Bastida Virgili, et.al 'Risk to space sustainability from large constellations of satellites' 126 Acta Astronautica 154, September–October 2016

[52] Space 2030 Agenda, Item 3.6

[53] UNGA Resolution 1721 (XVI) of the General Assembly of the United Nations 20 December 1961; UNGA, 'International cooperation in the peaceful uses of outer space' 27 February 2001 A/RES/55/122

aspirations were also detailed in the Vienna Declaration on Space and Human Development in 1999.[54] Accordingly, a democratic and equitable international order will facilitate the use of space technology for the benefit of all nations and peoples and that its applications extended to developing countries"[55] These sentiments are not novel. The first space-focused UN General Assembly resolution emphasized the importance of avoiding "*the extension of present national rivalries into this new field*", the space.[56] In his seminal article, Jakhu argued that OST Article I sets forth a principle of global public interest in outer space.[57] So, the exploration and use of outer space shall be conducted in the interests of all states, both present and future.[58]

Correspondingly, before the privatization of telecommunications services across the globe in the early 1990s, communication satellites were not owned by commercial interests. INTELSAT, INMARSAT and EUTELSAT were non-profit intergovernmental organizations dedicated to providing services on a non-discriminatory (access for all) basis.[59] Although ownership by states primarily from the west had caused concern, they seemed to be working in the general public interest.[60] This structure of the early satellite communication organizations seemed to serve broader purposes, such as the peaceful use of space, demonstrated by the USSR and the eastern bloc joining INTELSAT from the 1980s to the 1990s. After this period, the perception of telecommunications services started to change. As privatization spread, it had come to be perceived less as a public service and more as a service available to the public where profit is a significant objective. One outcome of this change is that the service availability in an area will largely be determined by profit, not by the needs of potential users, unless regulations enforce otherwise. Telecommunications services provided via satellites shared the same fate, and the intergovernmental organizations were privatized one after the other. The contemporary mix of stakeholders, with a broader range of private interests in the commercial exploitation of space, is a relatively recent phenomenon. The LEO satellite broadband projects are a product of this era where public and private interests are intertwined. Despite the clearly stated goals, the utilization of orbital resources, most notoriously the geostationary orbit, on an equitable basis has always been

[54] The Space Millennium: Vienna Declaration on Space and Human Development (adopted by the Conference at its 10th plenary meeting, on 30 July 1999, Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), held in Vienna from 19 to 30 July 1999

[55] UNGA Promotion of a democratic and equitable international order A/RES/57/213 25 February 2003

[56] UNGA Question of the peaceful use of outer space.A/RES/1348(XIII) available at: https://theconversation.com/space-exploration-should-aim-for-peace-collaboration-and-co-operation-not-war-and-competition-169317

[57] Ram S. Jakhu, Legal Issues Relating to the Global Public Interest in Outer Space (2006). Journal of Space Law, Vol. 32, Pp. 31-110, Summer 2006, Available at SSRN: https://ssrn.com/abstract=2801681

[58] UNGA Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries A/RES/51/122, 4 February 1997

[59] *1961 UNGA 'communication by means of satellites should be available to the nations of the world as soon as practicable and <u>on a global and non-discriminatory basis</u>.'* UNGA Resolution 1721 (XVI). International co-operation in the peaceful uses of outer space Part D

[60] Francis Lyall and Paul B. Larsen, Space Law. A Treatise, 2018 Routledge 2nd Ed. 321

problematic.[61] The inclusion of new actors may present unique problems. However, the significance of equitable access to common resources as a guiding principle remains.

IV. Equitable access principle in International Telecommunications Law and Satellite Broadband

Equitable access to the spectrum and orbit resources is a foundational principle of international telecommunications regulation.[62] Along with the efficient use principle, this rule has been laid down in ITU Constitution Article 44 and strengthened through the Convention and ITU Radio Regulations, all of which are binding legal treaties. The ITU's operational role in international management of the spectrum and orbit resources means that the deployment of communication satellites, including the LEO broadband constellations, is organized in conformity with its regulations and governing principles. The ITU's areas of action include facilitating the accessibility to ICTs and broadband Internet through its mandate in radiocommunications, standardization and development sectors. The ITU's different roles are complementary. Its regulatory role in spectrum management and orbital resources is to be carried out in respect of its mandate to achieve equitable communications for everyone, reaching universal connectivity and bridging the digital divide.[63] Therefore, in international telecommunications regulations, the responsibility to facilitate equitable access to broadband connectivity does not need to be inferred from the right to equitable access to space resources or equitable benefit sharing to achieve fairness. It has been mandated expressly to the ITU as part of its mission.

The LEO broadband satellite companies apply to domestic regulatory agencies or administrations to obtain authorization and licenses for using frequency spectrum and orbit resources.[64] Once these are in place, they will again apply to national regulators to obtain licenses and authorizations for their user terminals and ground stations and to provide their services. The regulators ensure that their rules and regulations comply with these principles and that they undertake the necessary filing and registration procedures at the ITU, which provides international recognition of the frequency assignment and, as appropriate, the orbital positions used or intended to be used once it is recorded in the Master International Frequency Register (MIFR). This registration provides recognition and gives a right to claim protection from harmful interference. Prevention or mitigation of harmful interference has been recognized as a matter of international interest.[65] Compliance with these regulations has been high,

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[61] Cristian van Eijk, 'Unstealing the Sky: Third World Equity in the Orbital Commons' (2022) Air and Space Law 47(1); Hertzfeld, Henry R., and Frans G. Von der Dunk. 'Bringing space law into the commercial world: Property rights without sovereignty.' *Chi. J. Int'l L.* 6 (2005): 81.

[62] Matteo Cappella, 'The principle of equitable access in the age of mega-constellations.' *Legal Aspects Around Satellite Constellations*. Springer, Cham, 2019. 11-23.

[63] ITU Constitution Article 21(2); ITU RADIO REGULATORY FRAMEWORK FOR SPACE SERVICES "…we have to think carefully about how we can continue to use and improve satellite access to help connect the unconnected, and make the world a better and a fairer place for all'

[64] The assignment of a frequency to a particular radio station is the sovereign prerogative of the state having jurisdiction over the operator of the station as per ITU RR 1.18

[65] ITU Constitution art 45 (197-9) International interest: prevention or mitigation of harmful interference

and systems have mainly been established and operated in a manner that will not cause harmful interference to the radio services or communications of others who act in accordance with the provisions of the ITU Radio Regulations. The success is most likely due to the physical necessity of a global coordination procedure for the unobstructed use of satellite technology more than a sense of an obligation to inform each other as to their use of scarce global resources.[66] The ITU ensures that they are used rationally, efficiently, and economically, so all nations have equitable access to both.[67]

The significance of this operational role has placed the ITU at the centre of discussions regarding the promises and perils of mega-constellations. Previously, the tensions among nations' equitable access centred on the use of geostationary orbit.[68] Deploying large satellites to GEO for long-term missions has been more favourable because of the large footprint it enables with a single satellite. Its limited capacity has been the topic of contention. Unlike GEO, the LEO was not the subject of controversy before the emergence of large constellations. Regulations regarding small satellites in LEO had been less burdensome and did not require coordination among nations. As projects with large numbers of satellites started to be filed to address the urgent concerns, the ITU changed its regulations at the World Radio Conference in 2019 in the RR Resolution 35 (WRC-19). The term constellation was defined for the first time 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." An indicator of whether the non-GSO satellite system represents a "constellation" was added as a mandatory data item to the filing system under the same resolution.[69] The requirement for the coordination procedure has been redefined to include most constellation projects.[70] A new time-phased approach regarding the time frame allowed for the deployment of constellations has also been introduced. According to this, the projects' deployment must be completed within seven years, 10% within two years, and 50% within five years.[71] This phased approach has been designed to help ensure that the Master International Frequency Register is aligned with the actual deployment of non-GSO satellite systems. It is also intended to "establish the balance between the prevention of spectrum warehousing, the proper functioning of coordination, notification and registration mechanisms, and the operational requirements related to the deployment of non-GSO systems." In the likely case that the system is not fully deployed, this system sets forth the basic principle for modifying orbital parameters. The ITU's expertise in the management of spectrum and associated orbital resources and the ITU member states' familiarity with its system were instrumental in taking these essential steps to achieve a fairer and more equitable system of allocation of the LEO and the associated frequencies.

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[66] Francis Lyall and Paul B. Larsen, Space Law A Treatise, 2018 Routledge 2nd Ed., 212

[67] No. 0.3 of the Radio Regulations Article 44 (2) ITU Constitution

[68] Eric D. Altholz, 'WARC 1985: The Effects of an Equitable Access Regime on Satellite Telecommunications Services' (1986) 1986 University of Chicago Legal Forum 10; Cristian van Eijk, 'Unstealing the Sky: Third World Equity in the Orbital Commons' (2022) Air and Space Law 47(1)

[69] A.4.b.1.a of RR Appendix 4

[70] For all the ITU documents mentioned herein see: www.itu.int/pub/R-REG-RR/

[71] RESOLUTION 35 (WRC-19) A milestone-based approach for the implementation of frequency assignments to space stations in a non-geostationary-satellite systemin specific frequency bands and services The World Radiocommunication Conference (Sharm el-Sheikh, 2019)

IV.1. Equitable Access to Broadband and Sustainable Development

The correlation between connectivity and development is well established. In recognition of this link, the ITU's development sector was created in 1991, and ITU's mandate to provide technical assistance to developing countries was placed on the same level as its role in standardization and spectrum management. Development is recognized as a purpose in the ITU Constitution, which includes an obligation for its activities to be conducted in observance of the concerns of developing nations.[72] The ITU preserved an active role in global development and addressing emerging policy issues arising from the changing telecommunication environment. In 2002, bridging the digital divide was confirmed as a priority for ITU, and the ITU was authorized to take a leading role in the preparations and follow-up of the World Summit on the Information Society (WSIS).[73] After that, ITU had mixed success in its ambitions for more direct involvement in Internet governance.[74] Its decision-making mechanism, the one-country, one-vote system based on sovereign equality, had been the target of criticism.[75] The states with a relatively minor stake in the digital market have equal participation in decision-making. This system, combined with the influencing power of authoritarian states, primarily Russia and China, renders the ITU's decision-making mechanism unsuitable for matters beyond its original mandate from the perspective of the EU and the US. A primary concern was that the policies advocated by authoritarian regimes are likely to be inconsistent with international human rights norms.[76] As a result, at the World Conference on International Telecommunications in 2012, the EU member states joined the US and voted against amendments to the International Telecommunication Regulations, which would have extended the ITU's authority in regulating content and cyberspace governance generally.[77] Nevertheless, the ITU took on an active role in promoting the SDGs through ICTs by utilizing the pre-existing WSIS mechanisms and action lines.[78] The 2030 Agenda for Sustainable Development redefined global development goals by acknowledging environmental concerns along with social and economic

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[72] Article 12 and Article 17 of the ITU Constitution

[73] ITU, Final Report World Telecommunication Development Conference, Istanbul, Turkey, 18-27 March 2002

[74] Ian Walden, 'International Telecommunications Law, the Internet and the Regulation of Cyberspace' in Katharina Ziolkowski (ed), *Peacetime Regime for State Activities in Cyberspace International Law, International Relations and Diplomacy* (NATO CCD COE Publication 2013)

[75] Deborah Brown, 'Spotlight on Internet Governance: Part Three International Telecommunication Union' (*Accessnow* 2 March 2014) <https://www.accessnow.org/spotlight-on-internet-governance-part-three-international-telecommunication/> accessed on 1 May 2020; Avri Doria, 'Use [and Abuse] of Multistakeholderism in the Internet' in R Radu, JM Chenou and RH Weber (eds), *The Evolution of Global Internet Governance* (Springer 2014)

[76] Ian Walden, 'International Regulatory Law', in Ian Walden (ed), *Telecommunications Law and Regulation* (5th edn, Oxford University Press 2018); Laura DeNardis, *The Global War for Internet Governance* (Yale University Press 2014) 33; Tim Maurer and Robert Morgus, 'Tipping the Scale: An Analysis of Global Swing States in the Internet Governance Debate' (Internet Governance Papers No. 7 CIGI 20 May 2014)

[77] Deborah Housen-Couriel, 'The "Dubai Clash' at WCIT-12: Freedom of Information, Access Rights, and Cyber Security' in Pnina Sharvit Baruch and Anat Kurz (eds) *Law and National Security: Selected Issues* (Institute for National Security Studies 2014); Patricia Paoletta and Peter McElligott (n 55)

[78] ITU, 'ITU's approach to using ICTs to achieve the United Nations Sustainable Development Goals' News 13 May 2020 available at <https://www.itu.int/hub/2020/05/itus-approach-to-using-icts-to-achieve-the-united-nations-sustainable-development-goals/> accessed on 22 October 2022

objectives. Achieving SDGs require environmental, social, and economic concerns to be integrated into decision-making processes across sectors, territories, and generations.[79] The critical role of ICTs and global interconnectedness are reiterated in SDGs, as is the role of the ITU.

The ITU, together with the Broadband Commission co-established with UNESCO, advocates for the recognition of broadband as a basic global public utility because global connectivity ought to be meaningful to enable the SDGs. Meaningful connectivity necessitates broadband connectivity that is '*available, accessible, relevant, and affordable, but also that is safe, trusted, user-empowering and leads to positive impact*'.[80] Therefore the broadband promise of large LEO constellations, especially in places where terrestrial infrastructure fails, makes it an invaluable asset in the global pursuit of the SDGs. Indeed, the importance of bridging the digital divide increases by the day, as the resources and opportunities that are available to those who have meaningful connectivity grow rapidly. In its role in promoting development, the ITU encourages using LEO broadband constellations along with other communications infrastructure available, including other communication satellites in higher orbits.[81] Adopting rational and efficient licensing and authorization requirements as well as avoiding additional market access requirements, are among the actions that are to be encouraged at the domestic level.[82] The targeted economic development shall be generated from the connectivity that becomes available rather than levering unreasonably burdensome regulatory constraints for revenue generation. The task ahead is not easy that is to put forward policies, plans, and programs that the diverse range of stakeholders can adopt, so that this technology that is quickly becoming available, is secure, affordable, and reliable to use. In line with the sustainability considerations, these actions are to be conducted in a manner that observes environmental concerns, primarily space sustainability.
of information.

IV.2. Summary

International organizations are forums where nations can agree on solutions to new complex problems. The ITU has a dual role in relation to LEO broadband satellites. Its operational role in space resources and spectrum management is critical to ensure access to these global resources on an equitable basis. Its role in bridging the digital divide and facilitating sustainable development through the use of ICTs entails promoting the right policies to use all available communication infrastructure in underserved areas. Presuming that the nations that have developed the technology and have the capacity to deploy and operate it benefit most from the use of shared global resources, the goal should be to make sure that its use is available to others under sufficiently good conditions, safe, reliable and affordable. The allocational criterion is a product of social context and also history.[83] A fair distribution of opportunities or goods will potentially mitigate the sustainability concerns arising from the new space race to deploy constellations consisting of large numbers.

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[79] Rachel Emas, 'The Concept of Sustainable Development: Definition and Defining Principles' (2015)

[80] State of Broadband Report 2019: Geneva: International Telecommunication Union and United Nations Educational, Scientific and Cultural Organization, 2019. Licence: CC BY-NC-SA 3.0 IGO; ITU, 'Global internet growth stalls and focus shifts to 'meaningful universal connectivity' to drive global development' Press release 22 September 2019

[81] Un, Introduction for Small Satellite Handbook https://www.un.org/en/content/digital-cooperation-roadmap/

[82] John Garrity and Arndt Husar, 'Digital Connectivity and Low Earth Orbit Satellite Constellations Opportunities for Asia and the Pacific' (2021) 76 ADB Working Paper Series

[83] Franck, Thomas M., 'Fairness and International Law: An Analytical Framework', Fairness in International Law and Institutions (Oxford, 1998; online edn, Oxford Academic, 22 Mar. 2012)

V. Equitable access principle in Internet Governance and Satellite Broadband

The LEO satellite broadband's promise is to revolutionize connectivity by mitigating the shortcomings of terrestrial networks and satellite communication networks in higher altitudes. In recognition of their future promise, LEO satellite broadband is also in the purview of Internet governance actors and systems in their respective roles in developing and applying shared principles, norms, rules, decision-making procedures, and programs that shape the evolution and use of the Internet, whether they are governments, the private sector or civil society.[84] In 2006, the UN set up Internet Governance Forum (IGF) to facilitate multistakeholder engagement in policy dialogue on Internet governance issues. One of its original mandates was to *'advise all stakeholders in proposing ways and means to accelerate the availability and affordability of the Internet in the developing world*. [85] As of 2015, the IGF also endorsed SDGs and committed to undertaking its technical and public policy mandate in conformity with these. Therefore, the stakeholders agree that their objective is to facilitate universal, affordable and reliable access to the Internet to address problems arising from the digital divide and utilize ICTs for development.[86]

Internet governance issues have long been important for geo-political and geo-economic strategies.[87] Control and influence over the Internet's technical infrastructure have been recognized as proxies for controlling social, economic, and political spheres.[88] The expansion of connectivity transformation also confirmed the significance of the physical infrastructure, including telecommunication networks, as one of the most critical assets. The ownership of telecommunications technologies and influence and control over them have moved to the forefront of concerns associated with sovereignty, security, and power.[89] The 5G Roll-out Crisis has proved that the current geo-political rivalry and tensions transcended its cybersecurity-related concerns.[90] The LEO satellite constellations have emerged during this period of increased securitization of Internet governance. Their much-publicized use in the Ukraine-Russia war to facilitate Internet access to Ukrainians to counter restrictive actions by Russia confirmed their geo-political significance.[91] The prevalence and power of private actors further complicate existing tensions and security concerns over global communication infrastructures. The need to balance the security and cybersecurity concerns to achieve meaningful connectivity for

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[84] Tunis Agenda for the Information Society

[85] Tunis Agenda for the Information Society

[86] UNGA, 'Outcome document of the high-level meeting of the General Assembly on the overall review of the implementation of the outcomes of the World Summit on the Information Society'(2016) A/RES/70/125

[87] Laura deNardis, 'Internet Governance as an Object of Research Inquiry' in Researching Internet Governance Laura deNardis et al.,(2020) MIT Press, p.1

[88] Laura deNardis and Francesca Musiani, 'Governance by Infrastructure' in F. Musiani et.al. (eds) The turn to infrastructure in Internet governance, Palgrave MacMillan

[89] Myriam Dunn Cavelty & Andreas Wenger, 'Cyber security meets security politics: Complex technology, fragmented politics, and networked science' (2020) 41 Contemporary Security Policy 5

[90] Berna Akcali Gur, 'Cybersecurity, European digital sovereignty and the 5G rollout crisis' (2022) 46 Computer Law and Security Review

[91] Joanna Kulesza and Berna Akcali Gur, 'Satellite Internet Access in Times of Cyber Conflict' (2022) Directions EUISS

sustainable development, in consideration of the urgency to employ measures to preserve space sustainability, demonstrate the multistakeholder characteristics of the issue at hand. The existing Internet governance mechanisms are relevant both because of their internet governance-related aspects and their experience and expertise in multistakeholder engagement in addressing global problems.

V.1. Defining Internet governance

Management of Internet resources is based on the principle of multistakeholder governance - a distributed policy-making model reliant on the voluntary cooperation of key actors, usually identified as states, businesses, and civil society. They operate "in their respective roles"[92] via "rough consensus and running code."[93]. Although not new or unique to cyberspace, this approach differs significantly from national law-making or international norm development. States play an essential role in both scenarios. Yet, Internet governance gives governments and multilateral institutions a supporting role in establishing and enforcing "principles, norms, rules, decision-making procedures, and programs" for the international network.[94] A similar role for states is reflected in other areas of international relations, including environmental protection, pharmaceutical production, and banking, where much is left to good business practice, civil society input, and/or consumer choice. Arguably, however, nowhere is the interaction of governments, businesses, and individuals more complex, abundant, and transnational than online. This is likely due to three key factors: 1) the complexity and scale of online interactions with 5.3 billion people (66% of the world's population) using the Internet in 2022,[95] 2) the global monopoly of a few US-based companies[96] and 3) the gross value of the online market (in 2021, retail e-commerce sales estimated at 5.2 trillion US dollars worldwide)[97] the lines between roles of individual stakeholders are nowhere more controversial and disputed than in the online environment. This structure of online communications and connectivity exemplifies yet another aspect of Global

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[92] WSIS (2005). *Tunis Agenda For The Information Society*. Retrieved from: http://www.itu.int/wsis/docs2/tunis/off/6rev1.html.

[93] The phrase is a shorthand allusion to the decision making processes within the bottom-up models of governance, specific to the original technical communities behind the global network, with time adopted as the fundamental guideline for all Internet governance related decision making models. For the specific reference see: David Clark, 'A Cloudy Crystal Ball - Visions of the Future', Proceedings of the Twenty-Fourth Internet Engineering Task Force, pages 539-543, July 1992, < http://www.ietf.org/proceedings/24.pdf>; Erik Huizer, Stephen D. Crocker, 'IETF Working Group Guidelines and Procedures', RFC 1603, March 1994.

[94] William J Drake, 'Introduction: The Distributed Architecture of Network Global Governance' in William J Drake and Ernest J Wilson (eds), Governing Global Electronic Networks (Cambridge, Massachusetts: MIT Press, 2009) 8-9.

[95] According to the International Telecommunications Union (ITU). Retrieved from: https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx.

[96] On the content layer there are usually referred toas "GAFA': Google, Amazon, Facebook and Apple, but this hegemony is also true for the infrastructure layer with e.g. VeriSign holding a global majority package on names and numbers. For a recent (2022) review of VeriSign economic position see eg. https://seekingalpha.com/article/4517154-verisign-a-fairly-valued-monopoly

[97] Statista, Retail e-commerce sales worldwide from 2014 to 2026. Retrieved from: https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/.

North's domination over Global South, with all major suppliers or internet-related services domiciled in North America, Asia and, to a smaller extent, Europe. It also gives the Global North explicit and direct control over the nature and shape of the global digital economy. AAprimary reason behind the race to deploy large satellite constellations by major powers is best evaluated in the context of these power dynamics. The spacefaring nations that can afford to deploy large constellations or are home to companies that can are more or less the same as those that already dominate the ICTs and connectivity infrastructure.

The design of the contemporary Internet governance model was intended to directly counter this global imbalance, well known from other areas of economic interactions. Giving an equal seat at the table of protocol development and policy-making to all actors involved in the network's operation was to ensure that the Internet grants an equal chance of meaningful participation to all parties concerned. Many people continue to praise the network's unique governance model, seeing it as critical to the Internet's boom and rapid development since the early 1990s, which led to shifts in the global economy and fundamental political changes worldwide. However, the current multistakeholder model is far from ideal, as discussed below. The shortcomings are relevant as to what extent the multistakeholder model is suitable to engage with the issues concerning LEO satellite broadband connectivity.

V.2. Multistakeholder governance

Governance – a term often used about the unique Internet ecosystem - is neither new nor unique to the global communication network. A recent, comprehensive anthology by Levi Faur offers a versatile review of the rich array of contemporary policy areas subject to "governance". From state reform and democratic institutions to international organizations, global economic relations, labor relations, public health management, banking, risk management, and environmental protection, they cover it all.[98] Dutton refers to the Internet and its governance as "the Fifth Estate" in this context, describing how the Internet "is being used (...) in ways that support social accountability across many sectors."[99] He refers to the Internet's power over social relationships and political decisions, evoking the eighteenth-century concept of the Fourth Estate, which, he claims, has been replaced by the Internet's singular impact on global society. While nearing "a fuzzy term (that) can be applied to almost anything and (…) explains nothing",[100] Dutton's perspective on governance focuses on the actual challenge that the Internet presents to existing regulatory mechanisms, as well as the adaptability of its process and actors. However, as Bygrave correctly points out, the "nebulous and broad" concept of governance has been defined by other references, such as "processes influencing other actors" or "the sum of the many ways in which individuals and institutions, public and private manage their common affairs."[101] While "governance" is frequently associated with "government," Bygrave sees it as one of several methods of regulation. He supports a "decentered" definition of the latter, which includes activities

[98] See generally: David Levi Faur (ed), *The Oxford Handbook of Governance* (Oxford: Oxford University Press, 2012).

[99] William Dutton, 'The Fifth Estate' in David Levi Faur (ed), *The Oxford Handbook of Governance* (Oxford: Oxford University Press, 2012) 585.

[100] Lee A. Bygrave, *Internet Governance by Contract* (Oxford: Oxford University Press 2015) 12 citing Jessop.

[101] Bygrave, 11-17.

other than those of governments and state actors.[102] Drake, on the other hand, takes an "action-oriented" approach to global governance, focusing on the mechanisms or institutions that steer it rather than the actors who drive it. He defines global governance as "the development and application of shared principles, norms, rules, decision-making procedures, and programs aimed at shaping actors' expectations and practices and improving their collective management capabilities in global affairs."[103] This definition seems best suited for the following discussion on Internet governance because it accurately reflects the complexity of actions and institutions underlying contemporary global governance processes.

As previously noted, distributed governance based on consensus among various groups of stakeholders is not unique to the Internet model. As Weber and Weber point out, there are specific parallels with environmental law, where individual rights, such as the right to information and freedom of expression, particularly the right to protest, are granted by international treaties, most notably the Aarhus Convention.[104] This analogy is used by the authors to propose a "Memorandum of Understanding" between Internet governance bodies and civil society to ensure equal participation in the existing governance model. Other common analogies include references to international trade law, where self-regulation, good business practices, and political lobbying have always played a significant role in shaping global and local policies.[105] Multinational companies, particularly those in the banking industry, have long used their dominant position to influence policies and respond to popular consumer demands, even when no specific law required them to do so. Haufler cites particular examples such as international labour standards, information privacy, and environmental protection, in which the private sector takes the lead on policy formulation, and states only later repeat those within local and international laws.[106] International food safety regulations, most notably the Codex Alimentarius and its implementing norms within the World Health Organization (WHO), are also frequently referred to as "private law-making."[107] According to Henson and Humphrey, private standards for food safety and quality have become a "prevalent part" of global food governance, relying on standards developed by "private firms and standards-setting coalitions, including companies and NGOs.".[108] The document, developed by FAO and WHO, is a classic example of soft law and, while not binding on states, serves as a set of globally adopted fundamental safety standards among food suppliers.

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[102] Bygrave, 13.

[103] William J Drake, 'Introduction: The Distributed Architecture of Network Global Governance' in William J Drake and Ernest J Wilson (eds), Governing Global Electronic Networks (Cambridge, Massachusetts: MIT Press, 2009) 8-9.

[104] Rolf H. Weber, Romana Weber, Inclusion of the civil society in the Governance of the Internet. Can Lessons Be Drawn from the Environmental Law Framework?, Cri 1/2009, 9-15.

[105] For a detailed discussion see generally: Virginia Haufler, A Public Role for the Private Sector: Industry Self-Regulation in a Global Economy, Washington DC: Carnegie Endowment, 2013.

[106] Haufler, op. cit, 31-100.

[107] Spencer Henson, John Humphrey, 'Codex Alimentarius and private standards' in B. M. J. van der Meulen (ed) Private Food Law: Governing Food Chains Through Contracts Law, Self-regulation, Private Standards, Audits and Certification Schemes , Wageningen, The Netherland, Wageningen Academic Publications, 2011 , 149-174.

[108] Spencer Henson, John Humphrey, 42.

V.3. Second-order Internet governance - lessons learnt from multistakeholderism

These global governance perspectives help to better understand and set the stage for the Internet's multistakeholder model, offering lessons and analogies that can be applied to today's global network and the regime that underpins it. The Internet is intentionally decentralized to effectively defer threats to the network and its resources; there is no single point of control that, if compromised, could disable the entire global network. This reflects the original network design goal of creating a global communication system resistant to a single, likely nuclear, attack.[109] This decentralized design was founded not only on dispersed infrastructure (local software and network backbone architecture) but also on a democratic, peer-to-peer model of cooperation and trust. All network nodes have equal status, and their efficient operation is dependent on trust in other actors - trust has always been the oil of the global digital economy. This egalitarian, dispersed model differed significantly from other known governance models - whether public or private, networks and communities are based on authority, power, and enforcement. Despite lacking both, the Internet continued to function, and its governance model quickly proved critical to its success. What began as a US national security exercise in 1969 entered the global political discourse in 2003, when member states of the ITU recognized its social, economic, and political potential. WSIS in 2003 was the first official intergovernmental meeting to address the opportunities and challenges that the global network presents to international and domestic policies.[110]

It established the Working Group on Internet Governance (WGIG), a small group of professionals dealing with telecommunications and international relations appointed by member states, to identify the initial challenges and potential solutions posed by this global communication phenomenon to international policies. In 2005, the WGIG issued a report that defined "Internet governance" as "the development and application by governments, the private sector, and civil society, in their respective roles, of shared principles, norms, rules, decision-making procedures, and programs that shape the evolution and use of the Internet," a definition later adopted by the WSIS in its 2005 Tunis Agenda for the Information Society.[111]

This definition reflects the wide range of standard-setting and decision-making bodies and processes critical to the global network's day-to-day operation. It also expresses the fundamental principle of Internet governance: the multistakeholder principle. While "multi-stakeholderism" is widely used in international relations theory and practice, official UN documents frequently refer to a "multistakeholder approach" to Internet governance. The Tunis Agenda also emphasizes the importance of the multistakeholder approach as a means to "improve coordination of the activities of

[109] For a review of Internet's history and origins see: Roy Balleste, *Internet Governance. Origins, Current Issues and Future Possibilities* (Lanham, Maryland: Rowman and Littlefield 2015) 11-15.

[110] Most notable documents developed in the original WSIS process include: WGIG, (2005). Report of the Working Group on Internet Governance. Retrieved from: *www.wgig.org/docs/WGIGREPORT.pdf*; WSIS (2003). *Declaration of Principles; Building the Information Society: a global challenge in the new Millennium.* Retrieved from: http://www.itu.int/wsis/docs/geneva/official/dop.html; WSIS (2003). *Plan of Action.* Retrieved from: http://www.itu.int/wsis/docs/geneva/official/poa.html; WSIS (2005). *Tunis Agenda For The Information Society*. Retrieved from: http://www.itu.int/wsis/docs2/tunis/off/6rev1.html.

[111] Para. 34 of the WSIS Tunis Agenda, reads: "A working definition of Internet governance is the development and application by governments, the private sector and civil society, in their respective roles, of shared principles, norms, rules, decision-making procedures, and programmes that shape the evolution and use of the Internet'.

international and intergovernmental organizations and other institutions concerned with Internet Governance, as well as an information exchange among themselves."[112]

The principle of multistakeholder governance has also been recognized in the context of online human rights protection, as evidenced by the Council of Europe (CoE) 2011 Declaration of the Committee of Ministers on Internet governance principles, in which the ministers refer to "multistakeholder governance".[113] The CoE recommends "the development and implementation of Internet governance arrangements" in a way that ensures "the full participation of governments, the private sector, civil society, the technical community, and users, taking into account their specific roles and responsibilities, in an open, transparent, and accountable manner**".**[114] The document emphasizes two aspects of multistakeholder governance: equal representation from all community sectors and geographic regions. Regarding network integrity, the CoE ministers cite "security, stability, robustness, and resilience of the Internet" as "key objectives" of Internet governance.[115] This goal will be accomplished through "national and international multistakeholder collaboration" to preserve "the integrity and ongoing operation of the Internet infrastructure, as well as users' trust and reliance on the Internet."

While describing governance and its transformation, Jessop asserts that new governance designs are built on the mistakes of old ones, a process he refers to as "second-order governance".[116] This process brings with it a reordering of networks and improvement of communication modes rooted in constitutional changes. While his argument is focused on states, the general lessons on governance also apply to cyberspace with its multistakeholder model. The post-WSIS decade (2005-2015) fueled discussions on specifying the ambiguous notion of "Internet governance", most significantly through defining the "respective roles" of states, businesses, and civil society. Contemporary academic discourse seems to offer a few novel solutions to this challenge.[117]

V.4 Privatized Internet governance

Some authors emphasized the role of private actors in national and international policy-making. Bygrave rightfully notes that the whole ICANN ambiance relies on private contracts: between the Corporation and registries.[118] He extends this argument beyond the traditional multistakeholder configuration, contending for private Internet policy-making. The largest global "population" is controlled not through multilateral agreements but merely through the authority of private contracts and terms of service agreements. Bygrave perceives the contractual setup as a solution to many of

[112] WSIS Tunis Agenda, para. 37.

[113] Council of Europe, Declaration by the Committee of Ministers on Internet governance principles, adopted on 21 September 2011.

[114] Council of Europe, idem.

[115] Council of Europe, idem.

[116] Bob Jessop, The State: Past, Present, Future, John Wiley & Sons, 2015, 170

[117] For a comprehensive discussion on trends in Internet governance discourse see generally: R. Radu, J. M. Chenou, R. H. Weber (eds.), The Evolution of Global Internet Governance: Principles and Policies in the Making, Springer Science & Business Media 2014. For an analysis of different approaches to Internet governance see: D. Sylvan, Global Internet Governance: Governance without Governors, idem, 23-37.

[118] Bygrave,11-17.

today's Internet governance issues, such as disputes of regulatory authority and trans-border law enforcement. This approach provides effective solutions to many of the Internet's problems. Private law is a reality for all digital platforms, and the allusion to private dispute resolution is appealingly simple and quick. On the other hand, on the periphery of this policy trend, there are growing state efforts, rooted in the concept of sovereignty, to lead all Internet-related policies, particularly when it comes to securing state interests online. This trend can be seen in the UN as well as the EU, which has invested significant funds and efforts in its current cybersecurity policy. The prevalence of private LEO satellite broadband companies acting globally and extending their services across jurisdictions through partnerships with other private companies across the connectivity ecosystem as well as the governments who provide connectivity as a public service, is an extension of increased privatization of Internet governance.

V.5. Summary

Multistakeholder engagement in policy-making is often associated with procedural fairness. However, in and of itself, it is not sufficient to remove the underlying geo-economic and geo-political conditions that shape decision-making in traditional domestic and multilateral settings and to create a level playing field for all stakeholders, leading to a fair distribution of benefits and burdens. These conditions are rooted in global power dynamics among the actors varying with economic, social and political circumstances. [119] The policy-making for Internet governance-related matters is shared by the states, international organizations, the private sector, and multistakeholder platforms. The interplay of the connections between existing actors, procedural rules, and different forms of multistakeholder engagement produce the policies and norms. These mechanisms will complement the above-mentioned institutional processes in the context of LEO satellite broadband. Their contribution will ideally improve the fairness and equity of benefit-sharing if the stakeholders are convinced that the decision-making procedure is governed by the principles of procedural justice.[120]

VI. Conclusion

Prospects of rising global interconnectedness have intensified the existing economic and security-related tensions among nations. Rises in the major powers' spheres of influence and alliances among like-minded states have gained prominence in global policy-making. These developments will likely limit the participation of non-space-faring nations in international policy-making regarding LEO satellite broadband and benefiting from this type of space-based broadband connectivity on an equitable basis, potentially bridging the digital divide. The policies that aim for equitable benefit sharing from the utilization of space resources shall be limited by considerations of space sustainability. These policies are likely to be objectionable if they result in control by the few over the ICTs infrastructure of the many, thus increasing dependence, thereby sustaining the development gap. The policies will be objectionable also if they lead to loss of opportunity, for example by ruining the future viability of the LEO, a scarce global resource. The diversity of competing interests requires policy and rulemaking by institutions and mechanisms that have achieved the most legitimacy in addressing shared global challenges. The resultant governance system for LEO satellite broadband will likely be a mix of domestic, multilateral and multistakeholder systems.

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[119] Raymond M and DeNardis L, "Multistakeholderism: Anatomy of an Inchoate Global Institution' (2015) 7 International Theory 572

[120] Brendan Coolsaet and John Pitseys, 'Fair and Equitable Negotiations? African Influence and the International Access and Benefit-Sharing Regime' (2015) 15 Global Environmental Politics (2): 38–56

The existing regulatory and policy frameworks reveal common objectives. The utilization of the ICTs and the development of the infrastructure for connectivity are essential for realizing the SDGs. To contribute to the SDGs, connectivity has to be meaningful, making it available, accessible, relevant, and affordable. At this point in time these qualities require affordable and reliable broadband connectivity. However, in achieving the SDGs sustainability shall be the operative concept whereas development goals shall conform with that of sustainability, including the global environmental commons, which include space. Therefore, achieving meaningful universal connectivity for development does not justify the ruin or depletion of space resources. The large constellations pose severe risks to space sustainability and access to space resources. It is not desirable to exploit the LEO impulsively, motivated by geo-political or geo-economic rivalry. The space resources shall be used rationally, efficiently, and economically and the spectrum frequencies required for satellite services to reach the Earth. For that, an objective assessment of the need for space communications as complementary to environmentally less hazardous infrastructure, whether terrestrial or space-based.

Although most states and private companies are restricted by the economic and technological capacity to deploy and operate LEO broadband constellations, any restrictions on their right to do so, even if it is motivated by space sustainability objectives, will be objectionable based on their equal right to access space. Therefore, an equitable approach would be to agree on some fair terms of benefit sharing from the exploitation of space resources, which may constrain aspirations to congest the LEO further. The allocation formula will not be straightforward. Those who have the capacity to provide space-based broadband connectivity services will agree on fair terms with those who need the benefits but do not, at this point in time, have the capacity or share the desire to exploit the same resources.[121] Agreement on fair and equitable terms of benefit sharing will be in the interest of all by mitigating global security tensions in space, setting a peaceful environment for this business model, furthering the realization of SDGs and preserving outer space for future generations and for purposes beyond the exploitation of LEO resources.

An initial step should be a commitment by the service providers to comply with the principles adopted by the UN, ITU and the Internet governance platforms. In broad terms, all these governance mechanisms advocate broadband connectivity to be secure, affordable, and reliable. For LEO broadband companies, security and reliability should be accompanied by transparency regarding cybersecurity and data protection issues. Transparency is also key to mitigating dependency and control concerns. Affordability is also crucial to ensure that this technology is used where it is most needed and that the primary purpose of these is not to project control of the LEO. Price differentiation according to the region is the likely approach. These initial steps may lead to regulatory convergence at the domestic level, provide predictability and decrease market access barriers which will further the use of this technology. The UN and the ITU will continue their respective roles as well as the multistakeholder Internet governance mechanisms if the promise of this new venture is to be realized and perils to be mitigated.

[121] Thomas M. Franck, 'Fairness and International Law: An Analytical Framework', Fairness in International Law and Institutions (2012, online ed.) Oxford Academic