

Evolutionary Patterns of Earth System Laws and Outer Space Governance: Future of Space Law and Policy in the Third/Fourth World

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ABSTRACT

Space law is evolving in space-faring nations as the central element of science, technology and governance, as commercial actors centralise space as the next frontier for resource exploration and exploitation. The rise of military and commercial use has also introduced unprecedented risks of governance ranging from just war, liability, responsibility, property rights and more. In this complexity also lies an incertitude of who shapes the normative structure of the new space laws and policies. At the global level, international space law through treaties spanned just a decade, with the first treaty coming into force in 1967 and the fifth (and the last) drafted in 1979. The post-1980s developments have largely been through non-enforceable soft laws and national regulations. While the first-world states have taken the forefront in developing pro-commercial space laws, often dislodging the fundamental principles of international space law, the new space nations are struggling to shape their national space laws. The smaller nations are attempting to re-imagine law and legal scholarship around space governance but are forced to draft national laws that support and further hegemonic commercial interests. In this context, Earth System Law offers a normative framework to make space equitable and entrench common heritage principles. This paper argues that the current institutional structures and global space law frameworks promote an anthropogenic approach to outer space governance. There is a need for the third world and the new fourth world to orient space laws based on the Earth system's innovative legal imaginaries of functional, spatial and temporal complexities.

Keywords: ESL, Space Law, Anthropocene, Global South

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Patrones evolutivos de las leyes del sistema terrestre y la gobernanza del espacio ultraterrestre: el futuro del derecho y la política espacial en el tercer y cuarto mundo

RESUMEN

El derecho espacial está evolucionando en las naciones con actividad espacial como elemento central de la ciencia, la tecnología y la gobernanza, a medida que los actores comerciales centralizan el espacio como la próxima frontera para la exploración y explotación de recursos. El auge del uso militar y comercial también ha introducido riesgos de gobernanza sin precedentes, que abarcan desde la guerra justa, la responsabilidad, los derechos de propiedad y otros. En esta complejidad también reside la incertidumbre sobre quién configura la estructura normativa de las nuevas leyes y políticas espaciales. A nivel mundial, el derecho espacial internacional, mediante tratados, se extendió por tan solo una década: el primero entró en vigor en 1967 y el quinto (y último) se redactó en 1979. Los avances posteriores a la década de 1980 se han dado principalmente mediante leyes blandas y regulaciones nacionales no vinculantes. Mientras que los países desarrollados han liderado el desarrollo de leyes espaciales procomerciales, a menudo ignorando los principios fundamentales del derecho espacial internacional, las nuevas naciones espaciales tienen dificultades para definir sus leyes espaciales nacionales. Las naciones más pequeñas intentan reimaginar el derecho y la doctrina jurídica en torno a la gobernanza espacial, pero se ven obligadas a redactar leyes nacionales que apoyan y promueven intereses comerciales hegemónicos. En este contexto, el Derecho del Sistema Terrestre ofrece un marco normativo para lograr la equidad espacial y consolidar los principios del patrimonio común. Este artículo argumenta que las estructuras institucionales actuales y los marcos jurídicos espaciales globales promueven un enfoque antropogénico para la gobernanza del espacio ultraterrestre. Es necesario que el tercer mundo y el nuevo cuarto mundo orienten sus leyes espaciales basándose en los innovadores imaginarios jurídicos del sistema terrestre, caracterizados por sus complejidades funcionales, espaciales y temporales.

Palabras clave: ESL, Derecho Espacial, Antropoceno, Sur Global

地球系统法则与外层空间治理的演化模式： 第三/第四世界空间法律与政策的未来

摘要

随着商业主体将太空视为资源勘探和开发的下一个前沿领域，太空法在航天国家中正作为科学、技术和治理的核心要素不断发展演变。军事和商业用途的兴起也带来了前所未有的治理风险，涵盖正义战争、责任、产权等诸多方面。在这种复杂性中，也存在着“谁来塑造新的太空法律和政策规范结构”的不确定性。在全球层面，通过条约制定的国际太空法仅持续了十年，第一项条约于1967年生效，第五项（也是最后一项）条约于1979年起草。20世纪80年代以后的发展主要体现在不具强制执行力的软法和国家法规上。尽管发达国家在制定亲商业太空法方面处于领先地位，常常动摇国际太空法的基本原则，但新兴航天国家仍在努力构建其国家太空法。较小的国家正试图围绕太空治理重新构想法律和法学研究，但却被迫制定支持和强化霸权商业利益的国家法律。在此背景下，地球系统法提供了一个规范框架，以实现太空的公平性并巩固共同遗产原则。本文认为，当前的制度结构和全球太空法框架助长了一种以人为中心的太空治理模式。第三世界和新兴的第四世界需要基于地球系统法对功能、空间和时间复杂性的创新性法律构想来制定太空法。

关键词：地球系统法，太空法，人类世，全球南方

Introduction

Space technologies are becoming increasingly ubiquitous as their applications have expanded from satellite broadcasting to critical areas such as energy, military, and climate change. Many of the in-space and off-space innovations are central to the concept of the Anthropocene. As Kotze and others argue, “The Anthropocene requires us to rethink global governance challenges and effective responses with a more holistic understanding of the earth system

as a single intertwined social-ecological system” (Kotzé et al., 2022). To effectively confront the multifaceted predicaments of the Anthropocene, law must transcend its traditional compartmentalisation and embrace a holistic Earth system perspective. Despite a growing scholarly impulse to reconceptualise legal thought through more integrated paradigms, these endeavours frequently persist in disciplinary silos. A transformative shift demands a common epistemic foundation that not only bridges intra- and interdisciplinary divides but

also embeds transdisciplinary co-learning and stakeholder participation at the core of legal research and practice (Kotzé et al., 2022).

There is a need to rethink space law, policy, institutions and its global space architecture in sync with Earth System Law (ESL). With space becoming critical to several human activities, it is slowly turning to be one of the most dominant technologies that is shaping the Earth's future. Humanity is also entering into a phase where space law cannot be read in silos. In its conventional approach, space law was seen as too futuristic and compartmentalised. The nature of space is also evolving, as is the value. As per reports, the global space economy will be worth USD 1.5 trillion by 2035 (Di Pippo, 2023). However, the rise of advancements in space is intertwined with how marginalised nations in the global south are finding new voices that are shaping the future of space law that promotes equity, sustainability, and justice. The growing economic patterns in the global south are pushing these economies to invest in critical space technologies (*The Space Economy in Figures*, 2023). However, these developments are occurring without the support of international space law treaties, as the last space treaty (the Moon Agreement) was drafted in 1979.

As space is conceived to be an extension of Earth's single interconnected social-ecological system, space law also needs to be operated holistically, across boundaries of sectors, scales, and time. This becomes a challenge and responsibility of the third/fourth world as these

communities face issues of access to several modern technological know-how. As the 1967 Outer Space Treaty calls space a province of mankind, the larger question as to whether it is accessible to the third/fourth requires critical investigation (Van Eijk, 2022; van Eijk, 2025).

For this article, the use of the third/fourth world is used in the context of how critical international law and relations look at them. In the discourse of international law, "the Fourth World Approach to International Law (FWAIL) is the new formation of a critical methodology for analysing the international law framework. The idea of "us" in international law paves the way for the discrimination of the "others" in international law. The Third World Approach to International Law (TWAIL), though claiming to include all the "others" of international law, fails to include the concerns of all the marginalised and excluded "others" (Becker Lorca, 2023; Fukurai, 2018; Tayal, 2024). Space becomes an interesting case to critically study this exclusion, as Anthropocene reminds us that the Earth system does not stop at the edge of our atmosphere.

Human Activities in Orbit and ESL

The biggest change in space technologies has been to place human activities centre of how future technologies centralise innovation in space. However, a lack of understanding of how to regulate space activities can also directly influence

the Earth System. For instance, orbital congestion can threaten weather monitoring and climate research. Rocket launches release carbon into the atmosphere. The developments around resource extraction on the celestial bodies can reshape global energy supply, sustainability, and resource markets. In this context, ESL provides an ideological framework to better understand the cross-domain linkages. It would be immature to think of new space treaties, considering the current geopolitical challenges and political non-consensus. The next era of space regulations will be in the form of national space laws. ESL here provides a framework for understanding these cross-domain linkages and for ensuring that domestic laws evolve to reflect the reality of interdependence between Earth and space.

The current framework of space law is a patchwork of soft laws, guidelines, and national regulations; most of them have an inferior understanding of ESL. In the absence of treaties, the First World has promoted pro-commercial space laws. These first-world national space laws have a pattern of dislodging the core principles of international space treaties (Smith et al., 2024). Pro-commercial international Initiatives like Artemis Accords are pressuring many new space entrants to align their national frameworks with hegemonic commercial frameworks (Sandeepa & Variath, 2025). Having ESL values in the new frameworks is becoming more and more important with commercial satellites underpinning global finance, climate monitoring, and communications. Military

applications and dual-use technologies blur the line between peace and conflict (Variath, 2024). Liability, responsibility, and property rights have become contested legal principles within space law.

ESL scholars argue that the Earth system must be understood as a whole, and space and Earth must be co-governed as one integrated system. The emerging concept of earth-space governance captures this—instead of seeing Earth and space as separate realms, it emphasises their interlinkages. These ideas become potent, especially when private players are envisioning settlements on Mars and experimenting with lunar space extraction. These technological accelerations challenge the very boundaries of what “planetary governance” means. From the prism of ESL, there is a need to articulate and rethink the questions of equity and justice within space exploration: Who benefits from space mining? Who bears the risks of militarisation? How do developing nations access benefits in a system dominated by private corporations and powerful states?

The Dilemma of Mutual Dependence: ESL and Space Law

Sustainability on Earth and in space is mutually dependent. If orbital debris cascades out of control, Earth-based societies lose critical services. Conversely, Earth’s climate instability drives the push for extra-terrestrial resources and space colonisation narratives. The current model of space

governance structures and systems reflects power imbalances and geopolitical asymmetries. While progress in space is rapidly expanding, enforceable mechanisms are witnessing a slow death. This is where the Anthropocene lens becomes useful. Systems thinking is based on the belief that any system, whether natural or social, is best understood by a non-reductionist approach that focuses on the interactions between its constituent parts and its relation to other systems (Kotzé et al., 2022). The Anthropocene requires an effective response through a more holistic understanding of the Earth system as a single, intertwined socio-ecological system (Cirkovic, 2025). Space law must embrace the study of models of the Earth system. There is a need to develop a shared epistemic framework, with space law being reimaged by scientists, technologists, and communities. ESL is equipped with these legal imaginaries that can transcend old categories.

ESL can reshape norms for three governance structures. First, temporal governance regulates activities not just for present generations but for future ones. Second, functional governance, linking resource extraction in space to sustainability goals on Earth rather than unchecked commercial gain. Third, spatial governance, treating Earth, orbit, the Moon, and Mars as part of one interdependent system. This

is what this article calls the “earth space governance.”

The most important point in this discussion is to realise that space is no longer “out there.” It is within this larger system of human needs. Satellite constellations influence everything from agriculture to surveillance. Despite this, the current conceptual and methodological tools of space law are inadequate to meet the modern challenges of the planetary and multi-planetary era.

Voices of the Third and Fourth World

The third/fourth world must play a proactive role to address the embedded inequities and assert rights over the commons. ESL gives this opportunity to the marginalised to reimagine legal scholarship around space governance. There is a need to use ESL as a tool to push for South-South co-operation and collectively shape an alternative governance vision that resists fragmentation and hegemonisation. The absence of these critical voices can legitimise resource appropriation. ESL resists the normalising of inequities and can shift the discourse from planetary to multi-planetary governance. These imaginaries are powerful as they mobilise capital, shape public discourse, and redirect policymaking.

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