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Is Space a Global Commons?

Executive Summary

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The space industry has experienced major changes in recent years, including a drastic increase in successful orbital launches, more numerous and varied stakeholders, and new uses and destinations in space. These developments are raising questions of how the space domain is regarded from a policy and governance perspective. The most fundamental of these questions is: "Is space a global commons?"

If space is a global commons or a domain containing common pool resources (CPRs), policies and cooperative agreements may be necessary to preserve resource use. If space is not a common resource, other models involving private rights and sovereignty may come into play, which could lead to increased competition and risk of conflict. In exploring whether space is a commons, we look to answer the following essential questions:

- What does the phrase "Space as a Global Commons" mean?
- Is outer space a global commons or common pool resource?
- Can outer space be classified as a single economic good or model?
- Which actors refer to outer space using these terms?
- How can concepts from the governance of the commons and common pool resources productively inform various space policy discussions?
- Are there approaches from the governance of other shared domains (e.g., Antarctica, sea, air, and environment) that might be usefully transposed to space governance?
- What concepts from those shared domains do not translate well to outer space?
- What happens when some actors see space as a commons, while others do not?

Major space stakeholders disagree on whether space is truly a global commons. Although many academic references to the global commons specifically mention space along with the oceans, the atmosphere, Antarctica, and telecommunications (Buck, 1998), the most significant space-capable actors have made conflicting statements on commons status. International treaties such as the Partial Test Ban Treaty of 1963 lump space in with other global commons, but the term "commons" does not appear even once in the five UN outer space treaties. Even US leaders have made conflicting statements about the topic. Then President Obama referred to space as

a global commons in his May 2010 National Security Strategy (National Security Strategy, 2010). The Department of Defense reaffirmed this stance with statements made in the *Joint Operating Environment (JOE) 2035* (US Navy, 2016), which identifies outer space (particularly Earth orbit in the range of 60 to 22,300 miles above the surface) among other domains as essential to the prosperity of the nation. The same document claims that "[o]pen and accessible global commons are the pillars of the current international economy and empower states that use them to conduct commerce, transit, scientific study, or military surveillance and presence."

Then President Trump's Executive Order (EO) 13914 (April 6, 2020) contradicted these statements. The same EO also rejected the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement), giving insight into the possible motivations to not consider space a global commons. In 2019, NATO declared space an "operational domain" as part of its "deterrence and defense posture" (NATO, 2022).

Other nations, notably China, take the perspective that space is a global commons, calling it a "global public space" in a document from the Chinese Aerospace Studies Institute from 2013 titled *In Their Own Words: Foreign Military Thought*. However, some of these nations have programs or policies in place to exploit space resources, calling into question whether or not these policy differences are substantive.

While many nations seem to consider space a global commons, there is no consensus on this, even among space-capable nations. The subtle differences in terminology used complicates the matter. Furthermore, even nations that may consider space a global commons disagree on how to manage the domain. This imprecision hurts the cause for commonality, but it results from several factors. Space is not a homogenous domain and contains distinct categories of economic goods. Commons designations impact policy decisions, and policy that requires sharing a resource is likely to be a disadvantage to major stakeholders that have the benefit of early access. The separation between space-capable nations and space-incapable nations has created an apparent conflict in perspectives on space management (Laver, 1986). Nonetheless, effective space policy should benefit all nations in the long term, so understanding effective commons management is essential to protecting space for future use. Knowledge of the development of the commons concept is key to understanding effective commons management, so first we must consider the earliest examples of the commons, and how the concept has changed over time.

To understand the commons, we look to the earliest uses of the terms by William Foster Lloyd, and its modern application by Garrett Hardin, to understand that a commons is both rivalrous and non-excludable. The term "rivalrous" here means that a resource is finite and that its use or occupation by one person reduces its availability for another. The term "excludable" means that someone could control the use or access of a resource.

We consider that many scholars see these categories as a continuum instead of discrete binary attributes (Leach, 2004; Henry, 2022). This interpretation adds nuance to the commons discussion and explains why informed scholars can disagree about domain categories. Considering domain placement as a continuum instead of discrete categories, we can chart specific domains in the Domain Continuum graphic:

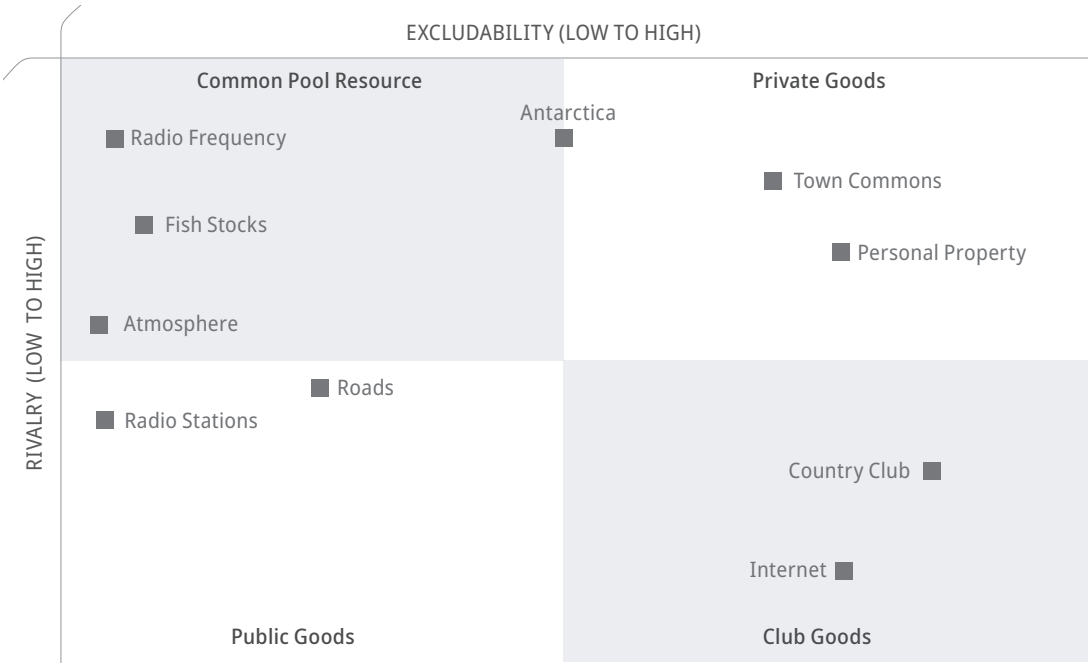

Figure 2. Continuum of Domains. Different types of goods expressed as a continuum, rather than just four discrete categories, as in Fig. 1.

The two principal international institutions involved in the progressive development and codification of international law and regulations governing space activities are the United Nations (UN) and the International Telecommunication Union (ITU). The ITU is itself a specialized agency of the UN, although it actually predates the UN. The ITU is responsible for the coordination and global governance of the use of radio frequencies by space systems and the equitable allocation of orbital slots in the geostationary orbit. The United Nations has adopted five legally binding space treaties and a large number of non-binding General Assembly resolutions, principles, and guidelines. Treaties have legal authority and often include specific requirements or prohibitions. The five UN space treaties are: the Outer Space Treaty, the Rescue Agreement, the Liability Convention, the Registration Convention, and the Moon Agreement. These treaties took decades to negotiate and sign, and apart from the Moon Agreement, they enjoy support by the majority of UN Member States. Although General Assembly resolutions are not legally binding but merely express the view of the UN as voted by its members, they are nonetheless considered politically binding by many states and therefore influence the practice and behavior of states.

From time to time, there have been attempts by States or groups of States to challenge the understandings embodied in these international agreements. The Bogota Declaration is a notable example of a declaration that the UN did not organize. This 1976 declaration by seven equatorial countries asserts that "...the segments of geostationary synchronous orbit are part of the territory over which Equatorial states exercise their national sovereignty." This declaration is in direct contradiction to UN principles and treaties to which some of these same equatorial nations are parties. These territorial claims are like the Antarctic claims made prior to the Antarctic Treaty, and like the Antarctic claims, they are not legally recognized.

We consider that space exists not as a single domain, but as multiple distinct domains (geocentric orbits, celestial bodies, and interplanetary space) with a shared access method. Elinor Ostrom described eight design principles used to define the strength of a commons management mechanism (Ostrom, 1990). We use Ostrom's institutional analysis to evaluate the strength of existing space domain management mechanisms, as depicted in *Table 1.1.* This tool also allows us to identify deficiencies in the existing management mechanisms.

SITE	Clear boundaries & memberships	Congruent rules	Collective-choice arenas	Monitoring	Graduated sanctions	Conflict-resolution mechanisms	Recognized rights to organize	Nested units	Institutional performance
EARTH ORBIT	Yes	Yes	Yes	Yes	Weak	Weak	Yes	No	Fragile
CELESTIAL BODIES	Weak	Weak	Yes	Weak	No	No	Weak	No	Likely to Fail
INTERPLANETARY SPACE	Yes	Yes	Yes	Yes	Weak	Weak	Yes	No	Likely to Fail

Table 1.1 Comparison of Mechanisms.

Overall, the institutional performance of each space management mechanism scores "fragile" or "likely to fail." The major gaps include monitoring, graduated sanctions, conflict resolutions, and nested units.

Some terrestrial domain mechanisms could be helpful frameworks to consider for one or more of the space domains. For example, the Antarctic Treaty could be a helpful framework for lunar activity. This treaty would prohibit territorial claims, and it would reserve the Moon for scientific research. However, stakeholders could still use lunar resources to some extent. Additionally, this treaty would encourage international cooperation in the name of scientific research. Resource use could also draw from existing management mechanisms. For example, stakeholders could use a management structure like that for deep seabed mining to manage celestial body in-situ resource utilization (ISRU). Like the International Seabed Authority, which acts as an agent for developing nations, states could create an international space mining authority to act as an agent for nations not yet capable of this technology.

To protect Earth orbit from overcrowding, states could establish cooperative agreements to limit the number of active satellites, and/or require deorbiting inactive ones. Nations that dominate the satellite economy would likely react to such agreements with resistance. In a system where each participating state receives a number of satellite credits, developing states could sell/lease their credits or hold them for future use. This allows the utilization of the orbital domain while still protecting this domain as a commons. This approach might encourage safely deorbiting satellites once they are obsolete so that other satellites can take their place without increasing the total number. This management strategy may help to avoid the Kessler Syndrome. However, we acknowledge that Earth-based domains are fundamentally different from space domains and that no single existing mechanism is sufficient to manage all the space domains.

We also consider novel mechanisms such as New Zealand's Te Urewera Act (2014), which recognizes that ''the rights, powers, and duties of Te Urewera must be exercised and performed on behalf of, and in the name of, Te Urewera…by Te Urewera Board." A diverse set of stakeholders representing both legal traditions comprises the board. While the stakeholders for space domains represent different interests, granting nonhuman legal person status to space domains—particularly celestial bodies—could be an effective management method. This strategy, coupled with a board protecting the interests and integrity of the domain, satisfies most of Ostrom's design principles for commons management and may prove more effective than traditional treaties. Critics condemn privatization in commons discussions because it monopolizes a resource. This action obviates resource use by others, but in some cases, it is the only effective strategy for sustainable use. The legal structures in place at a national level allow for many of Ostrom's design principles to be satisfied, but they also prevent true collective choices. Stakeholders can only implement privatization on excludable resources, while most

or all Earth orbits and interplanetary space are not candidates for this method. However, some degree of privatization may be an effective management strategy on the Moon and other celestial bodies.

A single approach is not likely to be successful for each domain, just as a single treaty is not effective to protect space from despoilation or overuse. A successful approach to commons management will likely require each of these methods to some degree. Additionally, static mechanisms are likely to fail in a rapidly changing space economy. Hybrid and dynamic mechanisms, while challenging to create, are potential solutions to manage space commons.

Findings from this research reveal that the questions of commons status are often complex. Parts of space such as geocentric orbits may be an economic commons by way of their rivalry and excludability, but other parts such as celestial bodies and interplanetary space may not qualify by the same criteria. As Ostrom's institutional analysis shows, existing agreements are likely not robust enough to withstand the anticipated changes in the space economy. Stakeholders could collectively decide to designate space domains as a legal commons through treaties and agreements if this perspective reaches consensus.

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