# Governing the near intangible: the approaches of states to global space commons

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# Governing the near intangible: the approaches of states to global space commons

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**Abstract**

With technological developments rapidly expanding the possibilities for space resource extraction, the question of how these resources should be governed and distributed has become increasingly urgent. International treaties like the Outer Space Treaty and Moon Treaty have laid some groundwork for this. However, it remains unclear whether states treat outer space as a global common. This thesis investigates how six major spacefaring states: the United States, China, Russia, Japan, India, and Italy approach space resource extraction and allocation. Using a commons framework and drawing from International Relations theory, the study analyses 22 key strategy and policy documents from 2000 to 2025. It tests three approaches: strategic control, economic-institutional cooperation, and normative-common heritage. The results show that most states predominantly align with the first approach, favouring sovereignty and control. Japan and other countries partially align with the second, economic-institutional approach. The third approach, treating space as the shared heritage of humankind, receives limited support and appears mostly rhetorical. These findings suggest that the governance of space resources in the 21st century is largely shaped by strategic and economic interests. This research gives an empirical snapshot of state behaviour and offers a basis for future studies on global space governance and its emerging power dynamics.

**Key words:** Space governance, global commons, resource extraction, International Relations

# Inhoud

## 1. Introduction

Throughout history, the pursuit of territory and resources has shaped global politics. This was driven by security interests, access to resources, or the desire for power itself (Fukuyama, 2011). This tendency is still prevalent in the 21st century, as countries are making claims to land that they purport is historically theirs (Diehl, 2008; Meesterburrie, 2023; Hajda et al., 2025). But how does this work in places we have yet to come due to our current inability to travel there? With the proliferation of modern technology, it is becoming a real possibility that acquiring means outside of Earth will be feasible (Garcia-del-Real & Alcaráz, 2024). That we will possibly 'rule our solar system' and interact with the goods and commons of space. The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, also known as the Moon Treaty, foresaw this development and cautioned that "that an international regime should be established to govern the exploitation of such resources when such exploitation is about to become feasible" (Moon Treaty, 1979). With the current natural resource depletion on this finite planet, states and private actors are increasingly looking at the extraction of space resources such as asteroid mining (Yarlagadda, 2022). By extracting these outer space (hereafter: space) resources not through collective effort but through individual states and companies, it could have severe implications for the fair allocation of resources.

With the developments of modern technology, the rules to govern this realm struggle to keep pace with its advancements. AI, robotics, and private-sector innovation has outgrown the foundational legal structure established in the 1960s and 1970s (Pagallo et al., 2023). This shift necessitates the development of new frameworks and leaves room for actors to determine for themselves. The scholarly field remains in an early stage, with scholars of governance and collective action actively working to develop appropriate theoretical and institutional frameworks (Bower, 2023; Ostrom, 2009; Shackelford; Tepper, 2022). While these attempts by scholars are fruitful in advancing our knowledge for the future, applying a commons and public goods framework to space is not short of problems. The main problem encountered is one of conceptual disagreement about whether space, and the physical properties within it, constitute a global commons. The sheer size of space between physical bodies is generally regarded as a public good as it is both non-excludable and non-rivalrous (Oakland, 1987). This non-excludability was codified in international law in 1966 from the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer

Space (also known as the Outer Space Treaty; Outer Space Treaty, 1967). It posits that the exploration and general use of space shall be carried out for the benefit of all mankind. This still just discusses the physical realm in space but not its interactable properties, such as celestial bodies or planetoids. In other words, these conceptions concern the part of space that is a public good and not the parts which more closely resemble global commons and common-pool resources. It is within this latter category that contention arises. Specifically, over whether space and its resources should be regarded as a global commons.

In this regard, another pertinent addition from the Moon treaty was that "the Moon and its natural resources are the common heritage of mankind" (Moon Treaty, 1979). In other words, these resources are the collective birthright of every person on the planet. While ambitious, it has as of yet only been ratified by 17 countries, of which 11 signatories (United Nations, 2025). This showcases a lack of success in building a strong support base for a normative conception for space as states are not following suit. As research into space governance is still quite nascent, some angles are heavily unexplored. The objects of study are mainly concerned with the structure of governance, space law and a part on how it ought to be **(**Ostrom, 2009; Tepper, 2017; SWF, 2022)**.**

Building on the gaps in current scholarship, this research explores how nation-states conceptualise and articulate their positions on space resource extraction and allocation. States have a uniquely strong position vis-à-vis the other relevant actors in deciding space governance, international organisations and private companies, as both organisations have to deal with the jurisdiction of national governments. International organisations cannot function effectively if they are not mandated, or their treaties are not cosigned by states and private companies have to deal with national legislation that limits their options. I underline the importance of a meta-constructivist view (Wendt, 1995), in that the action, interaction, and perceptions of the states regarding space governance shape the reality in which we live. The goal is not to focus on how space governance ought to be or how it will likely end up based on theory, it is to focus on how the states observe space governance currently. This will be done by analysing strategy and treaty documents in the 21st century. While the scholars rightfully theorise, the states in the field lead the way in how the governance will be structured. Therefore, it is important now— at the advent of increasing space possibilities and actors— to take a snapshot of how states make sense of and desire for space governance. This snapshot will entail how the states might have changed their viewpoints over this period and

where they stand now. This might also give insights in how they are adapting to a changing world order. This snapshot will be made by analysing how the most relevant space states, The United States (U.S.), China, Russia, Japan, India and Italy (European Space Policy Institute, 2021; World Population Review, 2025), conceptualise resource extraction and -allocation. These countries were selected as the first four have been able to extract resources back to Earth[1] and all six are the only states that can launch probes (an unmanned spacecraft designed to explore space). To make sense of how states conceptualise space governance, this research adopts a three-approach framework: strategic control, economic-institutional cooperation, and normative-common heritage. These approaches reflect competing logics which structure how states frame their interests and actions in outer space. The method of data analysis is qualitative content analysis. In this way, large amounts of information can be transformed into an overview. The research will be conducted alongside the research question: how do states with space capabilities approach space resource extraction and -allocation in the 21st century?

## 2. Literature review

This literature review explores the political dimension of space resource extraction and allocation. The review begins with definitions of resource extraction and allocation (2.1), followed by an overview of space governance (2.2), state capabilities and motivations (2.3), and the contested classification of space as a global commons (2.4). Finally, it addresses the changing global political context and its implications for future governance of space resources (2.5).

### 2.1 Space resource extraction and -allocation

Space resources are natural materials (e.g. minerals, metals, and ice) found on celestial bodies such as Moons, asteroids, or planets (Rabitz, 2023). Extraction involves the identification and collection of these resources. This process is driven by the potential to support further in-space operations (such as fuel or base construction) or to bring the resources back to Earth for use or economic gain (Jakhu & Peloton, 2017). Resource allocation concerns how access to these resources is distributed among the actors involved. It involves arrangements that

[1] See Chang'e 5 for China (Chen et al., 2023), Hayabusa for Japan (JAXA, n.d.), Luna 16 for Russia/Soviet Union (ESA, n.d.), and Apollo 11 for the U.S. (NASA, n.d.).

determine the conditions, who can extract, and how the benefits are managed. Allocation arrangements are often debated whether it is necessary or not (Goehring, 2020; OECD, 2008). It involves claims of property and equity and is generally concerned whether space truly belongs to everyone (explored further in section 2.3). As the emerging space economy grows and political competition intensifies, questions about extraction and allocation have become more relevant (Rabitz, 2023). It is especially important to avoid a tragedy of the commons if actors rush to exploit resources without coordination (Hardin, 1968). Legally, the 1967 Outer Space Treaty forbids national appropriation of celestial bodies while permitting their use. This creates tension when states such as the U.S. in 2015 have enacted domestic laws recognising property rights over extracted space resources (de Zwart et al., 2023). These political tensions are embedded in the broader history of space governance, which will be explored next.

## 2.2 Space Governance

*Space governance: origins and developments*

The origins of space governance can be traced back to the first regulations, policies and laws that attempted to help facilitate human activities in space (Bower, 2023). This was in the context of the start of a new space age with the U.S.-U.S.S.R. space race having started (NATO, 2007). The pursuit of technological advancements represented a point of great power competition, as both states aimed to achieve dominance in space over the other. Cross (2021) argues that framing the space race as inherently opposite forces is incomplete. She adds that the impetus to engage in space exploration was primarily ultrasocial. She defines ultrasociality as a "human predisposition to be other-regarding, empathic, and inclined to seek wide-scale cooperation, even among strangers" (Cross, 2021, p. 4). Cross adds that the astronauts and scientists worked together across nations and that from the 1920s onwards scientists were already calling for a sharing of technology and space. While she highlights some relevant information about the social nature of humans and the normative elements, establishing a regime that supports this would be difficult. Especially with regard to resources, this ultrasociality seems less applicable as great resource gains can be attained.

In response to the technological advancements in the 1960s, the first monumental treaty was introduced: the Outer Space Treaty (Outer Space Treaty, 1967). In the following twenty

years, this would soon turn into a proliferation of new treaties and principles of space governance being created. These first few treaties and agreements tried to safeguard and ensure the fair use of the important tenets of what is understood to be space governance today. These include scientific research, territorial expansion, prevention of (nuclear) militarisation, and resource extraction (Jankhu & Dempsey, 2016; Gabrynowicz, 2004). At its core, space governance is the attempt to guide human space activities by organisations and institutions to balance the interests of the diverse space actors while promoting norms and a cooperative playing field in space (Tepper, 2022).

*Space governance: contemporary developments and issues*

While these massive developments have been made, space governance is still relatively in a nascent stage, as states are currently unable to comprehensively inhibit the vastness of space due to our limited technology. At best, they only still regulate the area surrounding Earth and extract resources from our solar system. The most recent literature on space governance, then, mostly tries to focus more on how our current governance frameworks can be adapted to the realm of space. Masson-Zwaan (2019) illustrates that a new framework is as there has been a rapid proliferation of state actors in space but also from scientific, academic and private domains. This is different from the more state-centric approach of the 20th century. Harding (2013) explains the increase in space actors as coming from an ambition from states to expand their influence in their domestic sphere and also in international relations. He argues that these states recognise the long-term benefits of engaging with space governance, where it could become a source of development in the economic, technological, and political spheres. Additionally, the states realise the potential for innovative scientific discovery, pushing for new technology before being limited by new treaties and governance initiatives.

The most popular framework that is presented and introduced in the literature of space governance is the polycentrism model of Ostrom (2009; Shackelford, 2014; Tepper; Morin & Richard, 2021). Polycentrism in governance literature is defined as "[a] system of governance in which multiple authorities oversee the same area, albeit with different but overlapping interests and scopes of responsibility" (SWF, 2022, p. 2). It is essentially a decentralised forum with multiple responsible institutions and experts that work together to create shared norms and rules. Tepper (2021) argues that space governance already exhibits tenets of polycentrism, as new stakeholders are already establishing new avenues to suggest and push for certain policies and standards. Del Canto Viterale (2024) furthers this point by

underlining that this proliferation of actors has created a more complex and unpredictable global governance of space. One important issue that polycentrism also encounters is the form of the agreements in space governance. Masson-Zwaan (2019) shows this by explaining that the agreements made among states about the use of space have taken the form of principles, rather than legally binding treaties. Due to this, it risks having too little power to be able to effectively punish deviators from the norm, opening the avenue for strong countries and organisations to accomplish what they desire.

### 2.3 Space capabilities and motivations

This dynamic makes it essential to understand the varying capabilities and motivations of spacefaring states, as the most relevant states increasingly shape the structures of global space governance. States are driven to extract space resources not only through economic opportunities, but also to enhance their geopolitical influence and security (Jankhu & Pelton, 2017). The U.S. space laws and capabilities are the most comprehensive among all other space actors (Johnson, 2017). It has invested heavily in both governmental and private space programmes. World Population Review (WPR, 2025) puts it as the only country with a ranking of 7 on a 1-7 scale[2]. China similarly deploys advanced missions (e.g. sample returns and planned crewed flights) and is ranked 6 on the WPR scale (Jankhu & Pelton, 2017). While Russia has inherited a space legacy from the Soviet era, recent setbacks have put the space programmes in a grey zone (Vidal & Privalov, 2024). With the war against Ukraine, it crippled the country's access to space technologies and broader cooperation. This resulted in Russia's current stance being one of deterrence and securitisation. These three states remain the most dominant in terms of their capability. In comparison, Japan, India, and Italy have less capabilities. They can still send probes into space, conduct launches, and operate satellites but not send humans into space. Their current capabilities still position them to play a critical role in future space resource activities. Collectively, the motivations of these six countries are fueling a renewed global competition for space resources.

[2] "Countries focused on ground-based space activities are level 1. Countries that can also operate satellites are level 2. Countries that can also conduct launches are level 3. Countries that can also send probes further into space or other celestial bodies are level 4. Countries that can also send humans into space are level 5. Countries that can also operate a space station are level 6. Countries that have landed humans on the moon are level 7. As of 2024, the United States (NASA) was the only level 7 country" (WPR, 2025).

## 2.4 Space as a global commons

To ascertain whether anything is a commons, or a global commons, it is useful to define exactly what is meant by the two concepts. A commons is a resource domain wherein common-pool resources are found (Buck, 1998). These common-pool resources are a type of subtractable goods managed under a property regime, whose characteristics make it so that users cannot be easily excluded from the resource domain (Ostrom, 2008). In addition, each person's use of such resources reduces the benefits available to others. These commons can be small (e.g. a tiny lake used by fisheries) or large in scope (e.g. the high seas). Scholars speak of a global commons when this resource domain specifies areas and resources defined as being beyond sovereign jurisdiction (Vogler, 2012; De Moor, 2011). Designating space resources as a global commons has caused much contention in the scholarly literature regarding it. Before evaluating the arguments of whether resources fall under this distinction, it is important to examine two problems regarding the term.

*Global public goods and commons*

Firstly, there is the confusion that arises between global public goods and global commons. The concept of global commons refers to areas which are outside of the natural territory of states (Vogler, 2012; De Moor, 2011), for example the high seas, the seabed, Antarctica, and space. Public goods are a type of product that is non-rivalrous and non-excludable (Samuelson, 1954; Pickhardt, 2006). In other words, goods may be consumed by one consumer without preventing that consumption by others and no one can be excluded from using them. These public goods can be at the local, national, regional, worldwide or even cross-generational level. Global public goods are goods whose benefits or costs extend to nearly everyone, anywhere, and can also potentially impact anyone, anywhere (Kaul, 2015). Besides their similarities, the way in which they are used in the literature appears to be quite dispersed. Brando et al. (2019) conducted a discourse analysis on how these terms relate to power and found that the global commons approach promotes a bottom-up, democratic and polycentric approach, whereas global public goods emphasises a top-down, authoritative and monocentric approach. This distinction is relevant for this research, as it reflects the deeper normative assumptions space actors could hold: whether space should be governed inclusively as a shared heritage or managed through exclusive control by powerful actors or economic institutions. The second problem concerns different uses of the concept global commons itself.

*Commons as an economic feature and a legal regime*

An important distinction that Tepper (2017) put forward is the division of commons into an economic term and as a legal regime. So, on the one hand, commons as a resource where it signifies an object, a physical manifestation. On the other hand, commons can be a property rights regime or who has the legal governing power over the resource (Tepper, 2017). To be clear, this research involves both. As the economic commons refers to the extraction of resources found in space, the legal regime refers to the property rights regime in which actors have access to extracting these resources. The legal part is likely to be focused on more in the states' discussions and treaties analysed, as the resource for many states is still out of bounds.

Having discussed the two important caveats, whether the resources in space can be considered a global commons will now be specified.

*Space resources as a global commons*

Fitting the economic definition of commons, it may be conceptualised that the resources and minerals in space are commons. The biggest tension comes from whether it should be governed as such. On the one side, there is the more normative camp that emphasises that space belongs to us all (OECD, 2008, Brundtland Commission, 1987, Outer Space Treaty, 1967). Therefore, we have to ensure that this property is allocated fairly so that everyone can reap the benefits. Hollingsworth (2013) argues that the common heritage principle is crucial to instill in space law in order to protect space as a resource for all nations. Next to this camp, there are the sceptics. They illustrate that the global commons are not part of the agreements so far and that space is still up to claim (Goehring, 2020; Cumbers, 2014). They essentially refute the idea of common heritage and apply a national conception of territorial claims to space governance. This resembles a Westphalian sovereignty system, the idea that each state has the exclusive say over its territory (Osiander, 2001). When a country claims a new territory in space, they are the one that decides what happens to it and its resources. The non-rivalrous nature of these resources and the limited capabilities of smaller countries to participate in space could then lead to an unfair distribution of who gets the resources. Some authors additionally take issue with the sceptics' conception of space as a global commons as

it seems to appear that the expansion of space exploration is an extension of human colonisation (Milligan, 2023). Milligan and Young (1987) liken it to the subjugation of Indigenous folk throughout history, where it is crucial now to acknowledge it as a commons so that human activities in space do not reinforce further social injustice.

Thus, whether one accepts that resources in space are a global commons seems to boil down to if one accepts the premise that space belongs to all of us. Therefore, it is compelling to analyse the top states in this respect. To see which side of the argument they support. This analysis, however, cannot be separated from the broader political context, which will be covered next.

### 2.5 Changing political context

It is essential to look at both historical precedence and the structure of the international system to understand how approaches to the global commons may have changed in the 21st century. Firstly, it is important to take Cross' (2021) argument further. Her premise is that there was ultrasociality and teamwork among scientists and other involved parties in the 20th century. She provides strong evidence as she cites cases where there was an abundance of ultrasocial teamwork during the 1960s. These include the development of the International Space Station (ISS) and the joint Moon landing proposal (Cross, 2021). While this is adequate evidence for her premise, this does not directly speak for the 21st century. This time period could show quite different results, as technological innovation could create the means for countries to extract resources on a large scale. Secondly, the international political context is viewed by many scholars to be volatile and at the start of a new world order. Acharya (2018) offers an analysis of the decline of the 'American World Order' (AWO) and the emergence of a more decentralised, pluralistic international system. He highlights the weakening of the liberal order created after World War II. This order was built on U.S. military and economic power. Furthermore, it was supported by global institutions that integrated other states into the AWO. Acharya (2018) introduces the concept of a 'multiplex world' to describe the evolving global order. In this multiplex system, global governance is no longer dominated by a single hegemon. Instead, it is characterised by multiple centers of power. This includes emerging states, regional organisations, and non-state actors. This idea echoes the polycentric approach outlined by Ostrom (2009). Both conceptions provide multi-actor interconnected frameworks for understanding governance in different fields. This includes resource domains for Ostrom and international organisation for Acharya.

Mearsheimer (2019) seemingly comes to the same premise as Acharya. They both agree that the AWO is deteriorating. However, they do not come to the same conclusion. Acharya (2018 expects that the global world order will result in a more multiplex world, with interconnected systems and a wide range of actors. Mearsheimer (2019) concludes that a new realist order will be created. An order based on power politics and having a thin international order with limited cooperation. It is additionally possible that the remnants of the AWO still have large influence, even though scholars say it is subsiding. The two academics both reflect a volatile global political context and observe changing structures. The two conclusions that they give provide information about which of the three global common approaches is most feasible. It is possible that this volatile political context is reflected in the treaties and outputs of states in the 21st century. It may be expected that the new world order will exhibit a different structure and plans vis-à-vis the AWO. It could be the case that it moved away from the ultrasocial rationality to a more strategic or economic rationality. In the next section, theory will be introduced as to how and why states act in relation to global commons. The theory will be built upon, scrutinised, and made to properly include resource extraction and allocation.

## 3. Theoretical framework

### 3.1 Approaches to space resources

To understand how states approach space resource extraction and allocation, this research adopts a theoretical framework that integrates key International Relations concepts with existing models of global commons governance. For this research, an *approach* is conceptualised as the underlying rationality, governance preferences, distributive principles, and normative/legal principles that guide how states seek to manage space resources. Riddervold and Newsome (2021) identify three models that explain how states engage with global commons issues. These models all operate under different rationalities that underline three distinct approaches to space resources: strategic control, economic-institutional, and normative-common heritage. This section begins by introducing these three approaches to the global space commons, as originally put forward by Riddervold and Newsome (2021). It adds to these models by adding various dimensions relevant to this research using IR literature. Finally, these insights are integrated into a conceptual framework (see Table 1 at the end of

this chapter) that allows for the comparative analysis of how states approach space resource extraction and allocation.

*Approach 1: Great power policy – strategic control*

The first model is built on a foundation of neo-realism and suggests that conflicts over global commons can be minimised when control is concentrated in the hands of one or a few states (Riddervold & Newsome, 2021). Neo-realism suggests that states coexist in an anarchic environment and value security and power. They attempt to create 'balancing' and increase their relative strength to other powers. While norms, laws and institutions are acknowledged by neo-realists, they commonly insist that it has no grand effect on the anarchy in international politics (McKeown, 2014). Power and capacity are the primary deciders. Mearsheimer (2003) adds that great powers inherently challenge the status quo and seek to dominate their regions to ensure their own security.

In the context of global commons, this logic implies that powerful states will attempt to assert control over contested or shared areas like space (de Zwart et al., 2023). This would limit the overall openness and possibilities for other actors in the regime as states will aim to get the resources for themselves. This has huge consequences for the allocation as other states will not be privy to the regime. It is possible that state actors also use private actors to further their interests as well. (Riddervold & Newsome, 2021). This perspective aligns with the notion that space is becoming increasingly securitised, as states frame it as a vital strategic domain beyond just security (Peoples, 2010). Strategic dominance is therefore not just a byproduct of competition, but a deliberate governance choice aimed at achieving relative advantage and exclusion. The legality of this would reflect a more Westphalian conception of sovereignty, where land is claimed by the ones with the ability to do so. It follows that in this approach, space is not the common heritage of all humanity but up to strong states for strategic and security reasons.

*Approach 2: International cooperation – economic incentives*

The second model explains interaction in the global commons based on economic incentives and rationality (Riddervold & Newsome, 2021). This model type thereby lies closer to more liberal conceptions of IR theory. It assumes that while the international system remains anarchic, states and other actors often cooperate to maximise mutual economic benefits

(Keohane & Nye, 1973). Institutions could help in reducing uncertainty, manage interdependence, and provide frameworks for negotiation and stability.

In the context of resources in space, one might see more policies with non-state actors and possibly economic policies to decide access to the regime. It would also not be strange that actors might find it rational to cooperate and set up an international regime to decide who gets access to the resources (Riddervold & Newsome, 2021). This could still be skewed towards the powerful players in the regime, as the states that have access can restrict it for other states. The costs of conflict (such as space debris, legal disputes, or securitisation) can outweigh the benefits of cooperation. For example, shared use of the International Space Station (ISS) has demonstrated how joint ventures can reduce costs and future collaboration. This approach leads to a conceptualisation where the commons are regulated through negotiated economic frameworks, often involving both state and market actors. Governance becomes more market-based and open but is shaped by who has the most utility.

*Approach 3: Protecting the 'common heritage of mankind'– normative and bottom-up*

While both the first and second models assume that actors are instrumentally rational, always aiming to maximise their preferences, the third model takes a more normative constructivist approach. This approach emphasises how ideas, identities, and ethics shape state behaviour (Wendt, 1999). He put forward that anarchy is what states make of it, thereby suggesting that shared norms and concepts can change and redefine how actors perceive global spaces.

In the context of space commons, Riddervold and Newsome (2021) capture this in what they term the 'human heritage model'. It underlines the normative conception of the global commons that it is the providence of all. While the authors acknowledge the human tendency to create ingroups and exploit outgroups (e.g. racism), here they further the concept of human heritage as all-inclusive. The 'heritage' in the model signifies inheritance, while the 'human' part reflects the human rights aspect in this. In other words, these areas belong to all humans. This model is also supported by Cross (2021) who introduces the concept of ultrasociality; the biologically embedded tendency of humans to cooperate empathetically and collectively. She traces how early space exploration was driven by civil society and visionary ideals, not just state rivalry. The model also sees the biggest role for non-state actors among all of them, underlining the bottom-up power of everyone. It hereby also reflects a more polycentric approach, where actors at various levels contribute to the commons domain (Ostrom, 2009)

This model type would put forward that there has not been much conflict in the global space commons due to a concern for preserving the commons for all, including future generations (Riddervold & Newsome, 2021). Additionally, it would encourage discourse and knowledge to be shared among states in order to work together. Moreover, it would prescribe norm building and participation to ensure equitable resource allocation. The participants would have 'ultrasociality' among each other.

**Table 1**

*Conceptualisation of approaches to space resource*

| Approach | Rationality | Governance preference | Regime access and allocation | Legal/normative assumption |
|---|---|---|---|---|
| *(1) Strategic control* | States seek to maximise national power, security and relative advantage. | Preference for unilateral or exclusive control. Private actors may be used as proxies. | Competitive exclusion; power over others. | Space as a territory to be claimed and secured by states. Westphalian sovereignty. |
| *(2) Economic-institutional* | States pursue institutional arrangements to maximise mutual economic benefits. | Preference for regimes, rules-based access, and cooperation when beneficial. | Conditional openness, skewed by economic leverage. | Space as an economic domain governed through rational cooperation. |
| *(3) Normative-common heritage* | States are guided by ethical responsibility, equity, and collective human interest. Ultrasocial. | Preference for inclusive, polycentric governance. | Equitable, needs-based allocation including future generations. | Space as a global commons, part of humanity's shared heritage. |

### 3.2 Hypotheses

The three above mentioned approaches offer competing logics for how states engage with the governance and allocation of space resources. Each approach is grounded in different assumptions about rationality, legal norms, and preferences. These theories also offer a structured lens through which such behaviour and language can be empirically analysed.

Based on this, the conceptual framework (see Table 1) has been developed that categorises state action across four dimensions: underlying rationality, governance preferences, regime access and allocation, and legal/normative assumptions. These three approaches allow for a comparison of state behaviour in the global space commons and produce three separate hypotheses:

*(H1)* States pursue treaties and policies that give control over space resources, limiting access for other actors in order to advance their national power and security.

*(H2)* States pursue treaties and policies that create cooperative economic arrangements and regimes to manage access to space resources, aiming to maximise economic benefit.

*(H3)* States pursue treaties and policies that promote shared access to space resources, encouraging inclusive governance in order to preserve space as the common heritage of humankind.

## 4. Methodology

### 4.1 Research design

The design of the research is a comparative qualitative case study of the six most relevant states in the context of resource extraction capabilities. These are respectively the U.S., China, Russia, Japan, India and Italy. The time frame of the research is 2000 until 2025.

### 4.2 Case selection

These cases were selected as these countries have specific competences regarding resource extraction. While other countries also have capabilities such as space launch, the U.S., China, Russia, and Japan are the only states that have the technology to return samples to Earth[3]. These sample-return missions are spacecraft missions to collect and return samples from an extraterrestrial location to Earth for analysis and use (Smith et al., 2021). India and Italy were also included as these have the technology to send probes out into space. Although they have not yet conducted sample return missions, their growing technical capacity positions them as emerging players in space resource exploration (Goenka, 2025; Lafleur, 2024). Especially

[3] See Chang'e 5 for China (Chen et al., 2023), Hayabusa for Japan (JAXA, n.d.), Luna 16 for Russia/Soviet Union (ESA, n.d.-b), and Apollo 11 for the U.S. (NASA, n.d.).

Italy being involved in the European Space Agency, who has a Mars sample return mission planned in 2030 (ESA, n.d.-a). Their current superior technology could serve as a foundation for new technological breakthroughs. For instance, the creation of machinery that enables resource extraction on a much larger scale.

### 4.3 Methods of data collection

There are important points to address regarding data collection and the amount of data available. The sources of data that are relevant for this research include treaties and government policies. The choice was made to include both document types for two reasons. Firstly, the amount of data available on space governance is already quite limited. This also extends to one of its most nascent parts, resource extraction. A weakness of the study is that it can only analyse the available documents covered. Secondly, these two document types are able to give a succinct overview of the plans by states. A total of 22 of these documents were found for the six countries. These include mostly international treaties and proposed policies but also domestic documents. The places these documents were found was online governmental databases[4].

### 4.4 Method of data analysis

The method of analysis for this research will be a qualitative content analysis (QCA). Content analysis is a research method used to analyse and interpret various forms of data, such as documents, laws or social media content (Harwood & Garry, 2003). The goal is to break down complex information into categories that can be more easily understood and evaluated. It goes beyond merely tallying words or extracting the objective information in the texts. The focus is to examine meanings and patterns instead of only observing the physical characteristics of the text (Prasad, 2021). The qualitative aspect aids in interpreting the texts and the relationships among the concepts in detail (Schreier, 2012). A content analysis is particularly suitable for this research as the primary focus of analysis is on what the countries are saying in their documents. It is important to address the weaknesses of the study, as it provides an honest assessment of the study's validity and reliability. It clarifies the scope and limitations of the findings, particularly their generalisability. QCA introduces bias in two ways. The researcher first subjectively defines the thresholds and the indicators. This directly decides what the results will produce. The second bias is related to the interpretive role of the

[4] About half of these documents came directly from the UNOOSA database where these plans were proposed by the respective states. The rest came from national federal databases.

researcher. The researcher's assumptions and interpretations can influence the identification of the codes and other patterns, introducing a level of subjectivity.

Building on the conceptualisation in the previous section, a coding frame is created. A coding frame is a structured analytical tool that acts as a filter for interpreting research material (Schreier, 2012). It comprises main categories that capture the key dimensions of interest, along with subcategories that entail specific meanings within those dimensions. A frame significantly helps manage complex data by simplifying it into relevant distinctions. However, it can also limit the analysis, as any nuances outside the predefined categories may be overlooked (Schreier, 2012). Table 2 conveys the entire coding frame. Based on this framework, the subsequent section presents the empirical findings from the analysis

**Table 2**
*Coding frame for qualitative content analysis*

| Approach | Main category | Subcategories | Indicators |
|---|---|---|---|
| *(1) Strategic control* | Power politics and neo-realism | - Control and exclusivity of access<br>- Instrumental use of private actors<br>- National sovereignty and security. | Mentions of exclusive access over space resources, framing space activities in terms of power and security. |
| *(2) Economic-institutional* | Economic liberalism | - Market-driven cooperation<br>- Institutional arrangements<br>- Inclusion of non-state actors | Mentions of market-based cooperation, framing space activities in economic terms. |
| *(3) Normative-common heritage* | Collective responsibility and polycentrism. | - Common heritage and inclusivity<br>- Bottom-up participation<br>- Sustainability and equitable sharing | Mentions of norm-building and structured cooperation, framing space activities as the common heritage of humankind |

## 5. Results

The analysis of the policy documents reveals distinct patterns corresponding to the three approaches that reflect the underlying logics in space governance. Important to note is how the documents gained their grade in table 3. The coding frame in combination with the conceptualisation framework was used to filter which approach corresponds to the document. A complete correspondence would suggest that the country affirms the rationality, governance preference, regime access and allocation, and legal/normative assumption of that approach. As is evident in table 3, this also resulted in overlap of the approaches. An example that illustrates this and also captures the small role of the third approach in these documents well, is how many countries affirm sustainability goals and international cooperation. In case 9 (China), the government speaks about supporting peaceful utilisation and international cooperation. However, it does not substantively involve the rationality or concrete plans set out in the conceptualisation of the normative approach. Instead, it aims to dominate commercial space markets with the secondary approach as economic driver, showing its adherence to the strategic control of approach 1. Thus, sometimes overlap is caused by the rhetoric of the country saying one thing but then prioritising another approach. Additionally, it appears that the countries aim to prioritise one approach but also use tools from the other approaches (e.g. strategic control by using indirect coercive economic policies). Each hypothesis will now be evaluated to see how much support was found for them.

**Table 3**
*Full coding scheme*

| Document | Approach 1 | Approach 2 | Approach 3 |
|---|---|---|---|
| 1 (U.S.) | Strong | Partial | Weak |
| 2 (U.S.) | Partial | Strong | None |
| 3 (U.S.) | Partial | Strong | None |
| 4 (U.S.) | Weak | Strong | Weak |
| 5 (U.S.) | Complete | Partial | None |
| 6 (U.S.) | Strong | Strong | None |
| 7 (China) | Strong | Weak | Weak |
| 8 (China) | Strong | Weak | None |

| Document | Approach 1 | Approach 2 | Approach 3 |
|---|---|---|---|
| 9 (China) | Strong | Partial | Weak |
| 10 (China) | Weak | Partial | Partial |
| 11 (China) | Complete | Partial | None |
| 12 (Russia) | Complete | Weak | None |
| 13 (Russia) | Strong | Weak | None |
| 14 (Japan) | None | Strong | Partial |
| 15 (Japan) | None | Strong | Partial |
| 16 (Japan) | None | Partial | None |
| 17 (India) | Strong | Partial | Weak |
| 18 (India) | Partial | Strong | Weak |
| 19 (India) | Partial | Strong | Partial |
| 20 (Italy) | None | Strong | Partial |
| 21 (Italy) | Strong | Partial | Weak |
| 22 (Italy) | Partial | Strong | Weak |

*Note.* Table depicts correspondence levels of the documents and treaties to the three approaches. Correspondence grading scale order: none, weak, partial, strong, complete.

*Hypothesis 1: Strategic control*

The results strongly support the claim of the first hypothesis, which posits that states pursue treaties and policies aimed at securing control over space resources to advance national power and security. The data show a predominant alignment with approach 1 (strategic control) across many documents. Half of the documents have been rated as “Strong” or “Complete” correspondence, significantly more so than the other approaches. This approach is grounded in neo-realist theory. It emphasises sovereignty, unilateral control and relative advantage. Out of the six countries, every country except Japan has claims that are strongly correspondent to approach 1. Italy captures the overall meaning from this approach quite well as they explain in the 21st document that “[j]ust as in the 19th Century it was important to control the seas, in the 21st Century controlling space is crucial for national sovereignty, international security, economic competitiveness and progress in scientific research” (Italian

Council of Ministers, 2025, p.1). Here they highlight the strategic importance of a controlling regime, assisted by economic regulations and knowledge sharing.

The U.S. is the most radical of the countries in this regard as document 5 states that it must secure commercial and legal advantage, assert sovereign rights, and resist multilateral constraints that might reduce its freedom of action. Hereby it simply rejects the Moon agreement's premise that space belongs to all of us. This aligns with the conception of the scholars Goehring (2020) and Cumbers (2014) that assert that space is still up for anyone to claim. When these countries have claimed it, they are the sole sovereign of that area. The frequent references to sovereignty claims, national security and exclusive control over space resources in the documents provide strong evidence for the first hypothesis. This aligns with the theoretical expectation that states act as rational actors seeking to maximise their relative power by controlling critical resources and resource regimes.

*Hypothesis 2: Economic-institutional*

While the evidence supports the first hypothesis the most, the second hypothesis also has evidence for it. The second hypothesis posits that states pursue cooperative economic arrangements to maximise mutual benefits from space resources. The results indicate a substantial but more varied alignment than approach 1 (strategic control). Many documents show "Strong" correspondence with this approach. While this is less so than the first approach, the distribution of the other grades is very different. Both the first and (more so the) third approach include the correspondence level of "None". However, this correspondence level is absent in the second approach. This may be explained by the fact that economic incentives are quite inherent to resources and extraction of those resources. For countries that adhere to the strategic control approach, they can still use top-down economic policies that benefit them more than other parties. For the countries that include a more normative approach, it points more towards the institutional side of liberalism to create strong regulated markets.

While Japan was not included in the first approach, it is with India, Italy, and the U.S. the countries that most adhere to the second approach. In document 6 of the U.S., they explain that they are committed to creating legal certainty and facilitating commercial ventures. They aim to establish this by supporting non-binding multilateral collaboration and liberal

economic norms. While the other countries talk about establishing economic regimes, Italy is a bit different. It talks favourably about economic integration and growth opportunities in document 21 and 23. Though, this is more so in the context of the European Union. It aims to work together with the other countries and ESA to create a strong economic regime. This highlights the conditional openness part of the second approach, where economic leverage can skew negotiations in the favour of allies. Thus, this approach may be seen as the secondary approach, on which the other two approaches most overlap. In all documents there is some mention of the value of institutional cooperation. This supports the theoretical view of Keohane and Nye (1973) that states also engage in rule-based regimes and partnerships to harness economic opportunities in space.

*Hypothesis 3: Normative-common heritage*

The third approach that harbors a normative and bottom-up conception for space resources finds limited empirical support. The alignment with the third approach, which is grounded in collective responsibility, bottom-up cooperation, and equitable distribution, is generally weak or absent in most documents. Only a few instances show “Partial” or “Weak” correspondence, with no other correspondence levels higher than that. Russia and the U.S. are the ones with the least amount of correspondence to this approach. While rhetoric about sustainability and common heritage occasionally appears, it is often instrumental rather than actually foundational to the countries’ space policy. It is possible that the countries might cloak the agendas of the first two approaches in normative language, serving to indirectly legitimise exclusive capabilities and gains. If this is the case, it means that the correspondence level is even lower. An example of the normative language can be seen in Japan’s second document. They outline that space development must consider the impact that it has on the environment and that it must be conducted in a manner that contributes to realising the ‘dreams of humankind about outer space’. In the same document, it also talks about stronger economic incentives and the strengthening of Japan’s economic side.

What is evident from all of these approaches is how little resource allocation is taken into account. The only approach that strives for somewhat of a distribution is the third approach, attempting to create an equitable allocation. The concept of allocating is already foreign to the previous approaches (only in approach two there might be some in-group allocation), so having an equitable needs-based distribution might be too radical for current times.

While Cross (2021) indicates that there was ultrasociality and teamwork across countries in the 20th century, this does not seem to be the case in the 21st century. While there are many aspirations and strong normative rhetoric about the use of space for mankind, there are no laws that substantially support or embody the third approach embedded in the policies reviewed. Specifically, there is no mention of inclusive polycentric governance, needs-based allocation taking the future into account, and that space is part of humanity's shared heritage. The limited presence of the third approach aligns with the theoretical critiques that emphasise the dominance of state-centric and economic interests over genuinely bottom-up and normative governance frameworks in the current international space policy landscape.

*Discussion of the approaches*

The empirical findings echo much of the scholarly debate around the evolving nature of space governance. Scholars such as Cross (2021) and Ostrom (2009) advocate for a polycentric and inclusive framework for space governance, emphasising cooperation, shared responsibility, and collective human interest. However, the strategic and economically competitive behaviour observed in this study aligns more closely with the critiques made by Cumbers (2014) and Goehring (2020). They argue that states often approach global commons not as shared spaces but as arenas for national competition. This realist dominance supports Mearsheimer's (2019) prediction of a return to power-based geopolitics over liberal multilateralism. Conversely, Acharya's (2018) vision of a multiplex world (a decentralised, pluralistic order with room for new actors) finds little overlap. The minimal support for normative approaches further challenges the normative claims of scholars like Hollingsworth (2013) or Milligan (2023). Rather than framing space as a shared inheritance, most states remain committed to strategic and economic advantage. This reinforces the notion that the governance of space resources continues to replicate the political situations on Earth.

This research also contributes to the interaction and perceptions that states have about global commons. While the Riddervold and Newsome (2021) model provides a valuable framework, the results suggest that states often blend strategic and economic rationalities. As a result, the normative ideals are sidelined. This raises questions about whether a true 'polycentric' or 'common heritage' model is feasible in the current international system. It illustrates that while resource extraction introduces a new frontier, the logic guiding state behaviour remains largely consistent with traditional power politics and economic liberalism.

## 6. Conclusion

This research was the first attempt to analyse how leading spacefaring states approach space resource extraction and allocation using a commons framework. By evaluating 22 key documents from the U.S., China, Russia, Japan, India, and Italy, the findings provide a snapshot of how states in the 21st century conceptualise space governance in practice. The results show that states primarily align with the first approach, grounded in strategic control and neo-realist thought. These states exhibit a clear preference for policies that maximise their sovereignty, control, and relative advantage in space. This approach is particularly dominant among major powers such as the U.S., China, and Russia. Japan, and to a lesser extent Italy and India, show stronger alignment with the economic-institutional approach. This approach favours multilateralism where economically beneficial. The third approach centres on space as the common heritage of humankind. It received only marginal support and remained largely rhetorical. This suggests that while the language of inclusivity and sustainability is sometimes used, actual governance preferences lean towards either control or conditional economic cooperation. As such, the idea of space as a truly shared global commons remains a distant ambition under current geopolitical conditions.

The analysis presented here offers a foundation for future research in multiple directions. First off, future studies could expand the scope beyond states to include private actors and supranational organisations (such as the European Space Agency). Second, longitudinal studies could observe how state positions change in response to different variables (e.g. geopolitical events or technological developments). Finally, incorporating perspectives from the Global South could help evaluate whether current policies reflect broader interests.

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# 8. Appendices

## Appendix 1

*Documents per country*

**United States:**

(1) 2010: 51 U.S. Code Title 51- National and Commercial Space Programs
https://astro.unoosa.org/astro/national-law-details-page.html?page=/definitions/law/data/us_-_51_u.s._code_title_51.html

(2) 2015: U.S. Commercial Space Launch Competitiveness Act (codified at 51 U.S. Code)
https://astro.unoosa.org/astro/national-law-details-page.html?page=/definitions/law/data/us_-_u.s._commercial_space_launch_competitiveness_act.html

(3) 2018: Space Policy Directive-2, Streamlining Regulations on Commercial Use of Space
https://astro.unoosa.org/astro/national-law-details-page.html?page=/definitions/law/data/us_-_spd_-_2.html

(4) 2020: Artemis accords
https://www.nasa.gov/artemis-accords/

(5) 2020: Encouraging International Support for the Recovery and Use of Space Resourceshttps://www.federalregister.gov/documents/2020/04/10/2020-07800/encouraging-international-support-for-the-recovery-and-use-of-space-resources

(6)2022: 2022 COPUOS LSC – U.S. on the Utilization of Space Resources
https://vienna.usmission.gov/2022-copuos-lsc-u-s-on-space-resources/

**China:**

(7) 2000: China's Space Activities
https://www.cnsa.gov.cn/english/n6465645/n6465648/c6813162/content.html

(8) 2006:China's Space Activities in 2006
https://www.cnsa.gov.cn/english/n6465645/n6465648/c6477657/content.html

(9) 2011: China's space activities in 2011
https://www.cnsa.gov.cn/english/n6465645/n6465648/c6480839/content.html

(10) 2016: China's Space Activities in 2016
https://www.cnsa.gov.cn/english/n6465645/n6465648/c6768527/content.html

(11) 2024: Submission by the Delegation of China to the Working Group on Legal Aspects of Space Resource Activitiesof the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space https://spacenews.com/china-outlines-position-on-use-of-space-resources/

**Russia:**
(12) 2013:Main Provisions of the Fundamentals of the Russian Federation State Policy in the Field of Space Activities for the Period up to 2030 and beyond
https://astro.unoosa.org/astro/national-law-details-page.html?page=/definitions/law/data/rf-pr-906.html

(13)2014: The Fundamentals of the Russian Federation State Policy on the Use of the Results of Space Activities for Modernization of the Economy of the Russian Federation and Development of its Regions for the Period up to 2030 https://astro.unoosa.org/astro/national-law-details-page.html?page=/definitions/law/data/rf-pr-51.html

**Japan:**
(14)2002: Act on the Japan Aerospace Exploration Agency
:https://astro.unoosa.org/astro/national-law-details-page.html?page=/definitions/law/data/japan_-_act_no._161.html

(15) 2008: Basic space act
https://astro.unoosa.org/astro/national-law-details-page.html?page=/definitions/law/data/japan_-_basic_space_act.html

(16) 2021: Act on the Promotion of Business Activities for the Exploration and Development of Space Resources https://astro.unoosa.org/astro/national-law-details-page.html?page=/definitions/law/data/japan_-_act_no._83.html

https://astro.unoosa.org/astro/national-law-details-page.html?page=/definitions/law/data/japan_-_cabinet_office_order_no._73.html

**India:**

(17) 2017: Draft space activities bill https://prsindia.org/files/bills_acts/bills_parliament/1970/Draft%20Space%20Activities%20Bill%202017.pdf

(18) 2023: Indian Space Policy 2023 https://www.isro.gov.in/media_isro/pdf/IndianSpacePolicy2023.pdf

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**Italy:**

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