RESEARCH ON THE LEGAL SYSTEM OF OWNERSHIP OF THE RECOVERED SPACE MINERAL RESOURCES[1]

INVESTIGAÇÃO SOBRE O REGIME JURÍDICO DE PROPRIEDADE DOS RECURSOS MINERAIS ESPACIAIS RECUPERADOS

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ABSTRACT

The current legal system concerning the ownership of recovered space mineral resources is flawed because domestic unilateral legislation has broken through The Outer Space Treaty regime, international legal regulations are vague and the existing theories cannot guarantee and promote the development of outer space resources. The key to perfecting the ownership of recovered space mineral resources is to determine under the UN outer space system that the recovering country should be the first subject of rights to the recovered space mineral resources and private entities or non-governmental organizations can claim ownership or use benefits on this basis (property rights). Countries should therefore mutually recognize the connotation of resource rights and rich resource priority and then build a space resource management system with national property rights as the core.

Keywords: Recovered Space Mineral Resources;Resource Ownership Dispute;Outer Space Mining; Outer Space Legal System.

RESUMO

O atual sistema jurídico relativo à propriedade de recursos minerais espaciais recuperados é falho porque a legislação unilateral doméstica rompeu o regime do Tratado do Espaço Exterior, os regulamentos legais internacionais são vagos e as teorias existentes não podem garantir e promover o desenvolvimento dos recursos do espaço sideral. A chave para aperfeiçoar a propriedade dos recursos minerais espaciais recuperados é determinar, de acordo com o sistema espacial da ONU, que o país em recuperação deve ser o primeiro sujeito de direitos sobre os recursos minerais espaciais recuperados e entidades privadas ou organizações não governamentais podem reivindicar a propriedade ou usar os benefícios com base nisso (direitos de propriedade). Os países devem, portanto, reconhecer mutuamente a conotação de direitos de recursos e prioridade de recursos ricos e, em seguida, construir um sistema de gerenciamento de recursos espaciais com direitos de propriedade nacionais como núcleo.

Palavras-chave: Recursos Minerais Espaciais Recuperados; disputa de propriedade de recursos; Mineração no Espaço Sideral; Sistema Jurídico do Espaço Sideral.

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INTRUCTION

The exploitation of outer space resources is an important deployment of China's deep space strategy, which involves economic interests and national security interests. However, the relevant rules for the exploitation of outer space resources have not yet been established. Whoever controls the formulation of space rules has the initiative to exploit outer space resources. Among them, the prerequisite and key to the establishment of the rules for determining the ownership of the recovered space resources, specifically, the existing Outer Space Treaty regime cannot guarantee the smooth implementation of policies and plans for the exploitation of outer space resources by various countries. However, countries headed by the United States have stepped out of the conventional interpretation of Outer Space Treaties and directly granted private entities through unilateral legislation. Outer space resources enjoy ownership while ignoring the benefits of outer space resources that other countries should have. This is a manifestation of the continued unilateral hegemonism of the United States in outer space.

Secondly, the existing legal regime governing the ownership of outer space resources contains significant flaws, such as unilateral domestic legislation violating this international treaty regime, and the direct extension of domestic legal systems into outer space. Furthermore, existing international space law rules do not explicitly address space resources, and there is an even greater lack of clarity concerning ownership issues arising from space resource extraction. The promulgation of unilateral domestic instruments therefore creates significant tension with established international regimes and undermines efforts toward consistent global governance.

Given the national practice of the United States, the former Soviet Union, and China have already recovered the lunar minerals, it is a very urgent issue to determine the ownership of the recovered outer space resources. The international community needs to amend the unilateral legislation of the United States in a consensus way to restrain US hegemonism in the field of outer space.

1. THE RECOVERED SPACE MINERAL RESOURCES AND THEIR LEGAL NATURE

In the past few decades, due to the vague provisions of The Outer Space Treaty regime, the ownership of outer space resources has been a topic of endless debate. The large space powers with uneven technological development are competing fiercely to determine the ownership of outer space resources. Countries represented by the United States and Luxembourg confirmed that private individuals have ownership of the collected space mineral resources, but this has been explicitly opposed by some countries. Therefore, The current international legal framework for space mining activities is outdated and insufficient to ensure the promotion of international space law principles[3]. It is necessary to discuss the connotation and legal nature of the recovered space mineral resources.

1.1 Definition of recovered space mineral resources

There are many types of outer space resources. Broadly speaking, outer space resources mainly include three major categories: high-level resources, environmental resources, and material resources[4].What this article discusses is a material resource, but it is not a resource in the outer space commons. As for the recovered space mineral resources, as shown in this figure, the third way to explore and utilize outer space resources is to move outer space material resources to the earth.

Figure: Exploration and utilization of various outer space resources

Types of space resources / Ways to use space resources	In situ utilization	Move to somewhere in space	Transfer to earth
Outer Space Altitude Resources	✓		
Outer Space Environmental Resources	✓		
Outer space material resources	✓	✓	✓

[3] Popova, S. (2022). Regulation of Space Resources Mining: the Creation of an International Legal Custom. Право и политика. https://doi.org/10.7256/2454-0706.2022.12.39421.

[4] Xu Xiangmin.Utilization of Outer Space Resources and Perfection of the Legal System of Outer Space Environmental Protection[J]. China Population Resources and Environment,2007(4):111.

Chart source[5]

The collected space mineral resources are a kind of special property, and the attitudes and treatment methods of the governments of different countries are quite different. Currently, the Hague International Space Governance Working Group defines outer space resources as in-situ non-living resources that can be extracted or mined in outer space, including minerals and volatile substances, including water, but not including (a) satellite orbits; (b) radio Spectrum; and (c) Energy from the sun unless collected from special and scarce locations. At the same time, The Hague International Space Governance Working Group's definition of space resources does not include the secondary use of outer space resources, that is, (a) raw materials obtained from the use of space resources; and (b) marketing and distribution of outer space resources. Based on the above definition of space resources, the so-called recovered space mineral resources are the primary minerals and similar substances transferred from outer space resources to specific facilities on the earth.

In fact, due to the non-renewability of mineral resources, when the international community sets usufructuary rights on the recovered mineral resources, it means that each country has transferred the ownership of the mineral resources. Therefore, for the special international mineral resources that have been recovered, countries should reach a consensus through consultation to determine their ownership, and at the same time form a special benefit-sharing mechanism.

1.2 The legal nature of the recovered space mineral resources

Each country has its own international legal basis for determining the ownership of space resources for its interests, and there are huge disputes. The author believes that the attributes of the collected outer space resources are Res Communes, not common objects and the common heritage of mankind.

First of all, the recovered space mineral resources are not communal objects. The concept of *Res Communes* originated from Roman law and refers to things owned by

[5] Wang Jin. On the improvement of the international legal system for the development of outer space resources[D] Xiangtan: Xiangtan University, 2019)

no one and subject to use by all：things (as light, air, the sea, running water) incapable of entire exclusive appropriation. That is to say, all human beings have a common relationship with the common property and have the right to separate and freely divide the common property[6].There is a qualitative difference between the collected mineral resources and the air-like commons. The recovered mineral resources have gathered the power of the whole country, and the cost is not the same as that of the air. According to the concept that the recovered space mineral resources are common property, if one party collects and disposes of space mineral resources without the consent of the co-owner, it will violate this "common rights of all mankind." But in fact, there is no outer space resource management institution. The Committee on the Peaceful Uses of Outer Space (COPUOS) does not have the right to authorize this. Direct unilateral use and disposal are bound to harm the interests of developing countries, and it is easy to cause "other co-owners" to oppose such exploitation. But this damages the government and private entities that have invested huge costs, and the result will directly inhibit the process of space resource extraction.

Secondly, the recovered space mineral resources are not the common heritage of mankind. The principle of "common inheritance of humanity" in the "seabed area" is to realize the common interests of all countries, and the principle of applying the principle to the "moon" stems from the faithful compliance with the obligations of Article 11 of the "Moon Agreement". Many scholars have argued that the "principle of the common inheritance of property by mankind" is a principle under development. Moreover, the influence of the "Moon Agreement" is worrying. Countries such as the United States and Luxembourg have made it clear that space resources do not apply to the common heritage of mankind or the global commons. In addition, this characterization can easily turn the lunar resources into the next frozen Antarctic, which several aerospace powers would be unwilling to recognize and implement, and it is not the best choice to realize the common interests of mankind.

[6] Yang Zhizhuang. The trade-off between "regulation" and "deregulation" in optimizing the business environment[J]. Politics and Law Review,2020(04):101-113.

The fundamental reason for the above two legal qualifications being abandoned by the space powers is the inequality of interests caused by the tilt of ownership. That is to say, there is a big economic interest tilt in defining the recovered space mineral resources as "community" or "common heritage of mankind." Large aerospace powers or private entities have made huge investments and taken huge risks in the process of exploitation of outer space resources, but in the end, they cannot fully control and dispose of the resources recovered on the ground. They also need to obtain the consent of the "empty co-owners", which is a violation. Economic laws and economic justice, therefore, will hinder the pace of exploitation and utilization of outer space resources. This legal positioning is supported by most developing countries, but it is directly opposed by the United States and other major space powers.

Finally, the "*res commons*" in Roman law contains the concept that is not owned by anyone but used by everyone. However, some scholars often call this communal property. This is the wrong usage. Instead, it should be translated into communal items. The recovered space mineral resources are classified as communal items. The law is less binding, less mandatory, and more acceptable to governments and private entities involved in the exploitation of space resources. For the celestial mineral resources collected on the ground, due to the nature of communal objects, supervision of the storage and trading of space mineral resources is also indispensable. This aims to prevent governments and private entities from abusing their rights of disposal over space resources. The author agrees that this view has the following basis:

（1）Balance the interests of space powers and developing countries. Now, some space powers led by the United States, oppose the "global commons" and "the common heritage of mankind"[7]

（2）Recognizing that each country has rights over recovered outer space resources, including rights of independent disposal or property rights, would help clarify states' rights and obligations, thereby potentially reducing risks of unilateral abuse or conflicts.

[7] Reference news. Russian media: The U.S. space exploration program hides the ambition of "swallowing the universe" [EB/OL]. Sohu. (2020-4-10) [2025-1-30]. https://www.sohu.com/a /386768471_114911 .)

While fully equal opportunities for resource development in the “global commons” are practically unattainable, it remains essential to ensure that technologically less-advanced countries can still benefit from outer space resource exploitation. This requires establishing specific and detailed regulations to clarify how these benefits should be equitably shared[8].

In summary, various countries still have great uncertainty in determining the legal nature of the recovered space mineral resources, which is reflected in the attitudes of developing countries and large aerospace powers towards "community" and "common inheritance of mankind." It is quite different, and at the same time, the international community has not yet reached a consensus on the legal nature of communal objects. The legal nature of communal objects is the prerequisite and basis for determining the recovered space mineral resources and guarantees the legitimacy of the rights claimed by resource owners. The following discussion on ownership is also based on this legal nature.

2. NATIONAL LEGISLATION AND PRACTICES REGARDING OWNERSHIP OF RECOVERED OUTER SPACE MINERAL RESOURCES

From a historical development perspective, humanity’s utilization and exploitation of outer space resources is an inevitable trend. Countries’ positions regarding the legal nature of recovered space mineral resources primarily divide into two major camps: The first camp, represented by the United States and Luxembourg, advocates for unilateral national legislation permitting ownership of extracted space mineral resources, provided there is no claim of sovereignty over the celestial bodies themselves. The second camp, consisting of Russia, China, and a large number of developing countries, maintains that the exploration and use of outer space resources should be governed by international agreements reached through multilateral

[8] Deplano, R. (2023). INCLUSIVE SPACE LAW: THE CONCEPT OF BENEFIT SHARING IN THE OUTER SPACE TREATY. International and Comparative Law Quarterly, 72, 671 - 714. https://doi.org/10.1017/S0020589323000234.

consultation, emphasizing adherence to fundamental principles of international space law and the common interests of all nations.

2.1 The First Camp

The Artemis Accords camp, led by the United States, exhibits unilateral tendencies in the development of outer space resources. Legislation enacted by countries such as the United States, Luxembourg, and the United Arab Emirates has been criticized for attempting to bypass the principle of "non-appropriation" stipulated in the Outer Space Treaty, paving the way for resource privatization through domestic legislation[9].

In the competition for dominance in rulemaking, these domestic legislations and the Artemis Accords create a linkage between national laws and international agreements. By adopting a hybrid approach of "bilateral signing and multilateral collaboration," they emphasize the commercialization, marketization, and liberalization of outer space resource development. The core objective is to establish normative dominance in space resource extraction, laying the foundation for an international governance system primarily shaped by U.S. standards[10].

2.1.1The United States initiated unilateral legislation to determine the ownership of recovered outer space mineral resources

In 2015, the U.S. President signed the U.S. Commercial Space Launch Competitiveness Act, explicitly emphasizing that this Act does not assert any national sovereignty, sovereign rights, exclusive rights, jurisdiction, or ownership over any celestial bodies. However, it clearly establishes provisions to "ensure that U.S. citizens engaged in commercial exploration and recovery of space resources are free from harmful interference," and grants "ownership over any acquired asteroid or outer space resources, including rights to possess, own, transport, use, and sell the acquired

[9] Sundahl, M. (2020). U.S. space policy: An international model. Science, 370, 1045 - 1046. https://doi.org/10.1126/science.abf2456.

[10] Tang, Xinhua. "Western 'Technology Alliances': Strategic Construction of a New Technological Hegemony," Modern International Relations, 2020(4): 38-52.（唐新华.西方"技术联盟":构建新科技霸权的战略路径[J].现代国际关系,2021(1):38-4664）

asteroid resources or space resources, in accordance with applicable law and international obligations of the United States"[11]. This indicates that the United States government grants and guarantees the legality of private entities in exploring and utilizing outer space resources. Furthermore, it confers upon U.S. citizens various rights including possession, transport, usage, and sale, thereby providing legal support for private entities engaging in mining activities in outer space. In conclusion, the U.S. legislation in 2015 addressed the issue of domestic legal certainty regarding space resource exploitation[12].

In 2020, U.S. President Trump signed Executive Order No. 13914, entitled "Encouraging International Support for the Recovery and Use of Space Resources[13]", and explicitly excluded the notion of space resources as a "global commons." However, the order intentionally avoided answering the question of "what exactly space and its resources are" [14][15] . This ambiguity was deliberate on the part of the United States, aiming to eliminate the possibility of treating recovered space mineral resources as "common heritage." Concurrently, this order explicitly rejected the effectiveness of the Moon Agreement regarding outer space resource exploitation and emphasized that U.S. policy should encourage international support for such activities[16].

Furthermore, the United States has granted "U.S. citizens" various rights over the outer space resources they extract, including ownership, possession, transportation, use, and sale. At the same time, it distinguishes between space resources recovered

[11] The U.S. Commercial Space Launch Competitiveness Act (CSLCA) recognizes commercial property rights in resources extracted from extraterrestrial bodies. It also gives the Department of Commerce the power to license and regulate the U.S. commercial remote-sensing industry. The Act was updated in 2015.
[12] Vylegzhanin, A., Yuzbashyan, M., & Alekseev, M. (2024). International Legal Outer Space Policy of the United States of America. International Trends / Mezhdunarodnye protsessy. https://doi.org/10.17994/it.2023.21.3.74.5.
[13] Executive Order 13914, Encouraging International Support for the Recovery and Use of Space Resources, April 6, 2020, available at: https://www.presidency.ucsb.edu/documents/executive-order-13914-encouraging-international-support-for-the-recovery-and-use-space (last accessed March 12, 2025).
[14] Beery, J. (2016). Unearthing global natures: Outer space and scalar politics. Political Geography, 55, 92-101. https://doi.org/10.1016/J.POLGEO.2016.04.003.
[15] Vylegzhanin, A., Yuzbashyan, M., & Alekseev, M. (2024). International Legal Outer Space Policy of the United States of America. International Trends / Mezhdunarodnye protsessy. https://doi.org/10.17994/it.2023.21.3.74.5.
[16] Sec. 2. The Moon gAgreement. The United States is not a party to the Moon Agreement. Further, the United States does not consider the Moon Agreement to be an effective or necessary instrument to guide nation states regarding the promotion of commercial participation in the long- term exploration, scientific discovery, and use of the Moon, Mars, or other celestial bodies. Accordingly, the Secretary of State shall object to any attempt by any other state or international organization to treat the Moon Agreement as reflecting or otherwise expressing customary international law.

through public and private exploitation. In essence, however, this arrangement implies that the United States indirectly holds ownership over privately recovered outer space mineral resources, as exemplified by its ability to requisition these resources from private entities under the justification of “national security.

Additionally, Article 10 of the Artemis Accords stipulates provisions related to space resources[17]. Although it emphasizes that “the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty” and highlights the obligation to ensure that “information regarding space resource activities is notified in accordance with the Outer Space Treaty,” it clearly signifies a shift towards multilateralism in the rules governing space resource development[18]. However, the Artemis Accords have been criticized for undermining multilateral approaches to space governance because they were negotiated outside traditional international platforms such as the UN Committee on the Peaceful Uses of Outer Space (COPUOS)[19].

2.1.2 Luxembourg supports private ownership of recovered outer space mineral resources

Luxembourg plays an important role in the European Space Agency (ESA), positioning itself as a pioneer in the exploration and utilization of space resources[20]. Currently, the Luxembourg Space Agency holds that the Outer Space Treaty prohibits any nation from asserting sovereignty over outer space resources but does not prohibit ownership of mineral resources extracted from celestial bodies[21]. Consequently, on July 13, 2017, the Luxembourg Parliament enacted the Law on the Exploration and

[17] Rivaldi, R. (2022). THE ARTEMIS ACCORDS AND PROPERTY RIGHTS IN OUTER SPACE. Journal of Law and Policy Transformation. https://doi.org/10.37253/jlpt.v7i2.7236.
[18] Din, A. (2022). The Artemis Accords: The End of Multilateralism in the Management of Outer Space?. Astropolitics, 20, 135 - 150. https://doi.org/10.1080/14777622.2022.2144241.
[19] Ferreira-Snyman, A. (2021). Challenges to the Prohibition on Sovereignty in Outer Space - A New Frontier for Space Governance. _Potchefstroom Electronic Law Journal_, 24, 1-50. https://doi.org/10.17159/1727-3781/2021/V24I0A8685.
[20] Space Resources.SPACERESOURCES.LU INITIATIVE, https://space-agency.public.lu/en/space-resources/the-initiative.html.
[21] Space Resources.Space Resources.LU Initiative[EB/OL].Luxembourg Space Agency.(2019-11-18)[2021-5-24].https://space-agency.public.lu/en/space-resources/the-initiative.html.

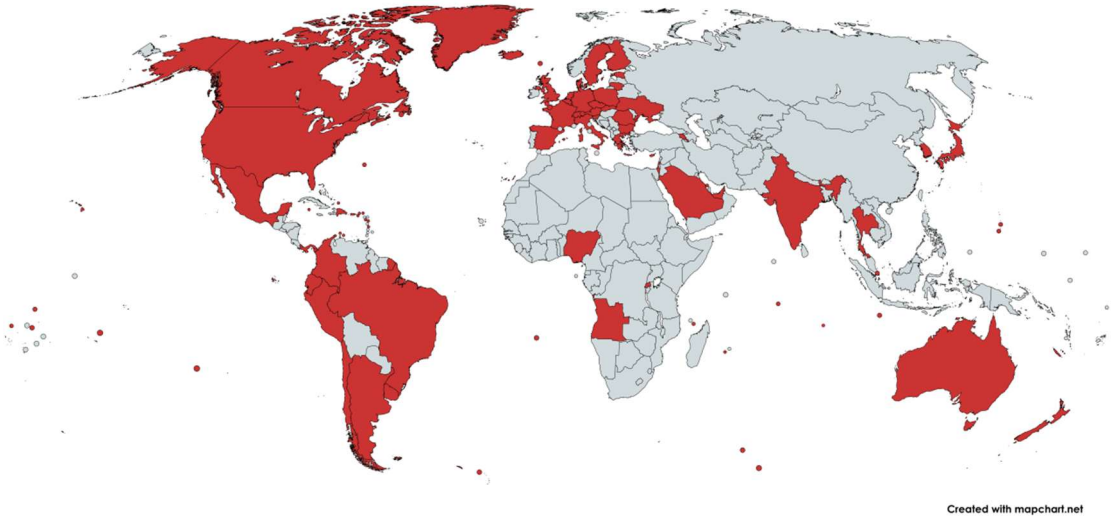
Utilization of Space Resources. This law's scope of application largely aligns with that of the United States' Space Resource Exploration and Utilization Act (SREU), but Luxembourg also extends its application to foreign-based companies that have offices in Luxembourg. Consistent with the U.S. approach, both Luxembourg and the United States explicitly avoid conflicts with the Outer Space Treaty by prohibiting prior claims of ownership over space resources, allowing ownership only after resources have been extracted. Essentially, the state authorizes and guarantees private entities' ownership rights to extracted space resources[22]. However, this does not prevent the government from purchasing space mineral resources from private entities, thus indirectly granting the state a form of ownership over such resources.

Additionally, Luxembourg's law establishes authorization and supervision requirements for private space exploration missions, including the exploration and utilization of space resources. Any entity planning to undertake space resource utilization must first obtain authorization from the competent minister or officials designated by relevant ministers. Without such written authorization from the responsible minister or ministers, no entity may explore or exploit space resources. Luxembourg's government has also set up a framework for authorizing and supervising resource extraction and other space activities[23]. Nonetheless, these regulations on resource extraction rights remain at the domestic legal level, lacking a solid foundation in international law. Thus, the legislation primarily represents Luxembourg's determination and stance towards developing its commercial aerospace sector. Future regulations on space resource ownership and the rules governing their development and utilization are expected to become more complete and systematic[24].

2.1.3 Japan authorizes its companies to hold ownership rights over recovered space mineral resources

[22] Beauvois, E., & Thirion, G. (2020). Partial Ownership for Outer Space Resources. Advances in Astronautics Science and Technology, 1-8. https://doi.org/10.1007/s42423-019-00042-0.
[23] Tang Yaoqi, "An Analysis of Legal Issues Concerning the Ownership of Outer Space Resources," International Space, No. 10 (2018), pp. 59-62.（汤耀琪：《外空资源所有权法律问题探析》，载于《国际太空》，2018 年第 10 期，第 59-62 页。）
[24] Space Resources.SpaceResources.LU Initiative. Luxembourg Space Agency.(2019-11-18)[2021-5-24].https://space-agency.public.lu/en/space-resources/the-initiative.html.

On June 15, 2021, Japan's parliament passed legislation—_Law Concerning the Promotion of Commercial Activities Related to the Exploration and Development of Space Resources_, allowing private companies to explore, exploit, and utilize space resources. It authorizes Japanese companies to prospect, exploit, and utilize various space resources, with the condition that such activities must first obtain authorization from the national government.



Map of Artemis Accords Signatory Countries[25]

Since the launch of the Artemis Accords in 2020, led by the United States, the scale of the accords and its diplomatic framework have dramatically evolved. The number of signatories rapidly expanded from the original eight to 53 (as of January 2025). This far exceeds the scale of the 1998 Intergovernmental Agreement on the International Space Station. As a form of soft-law strategy for space resource governance, the accords remain controversial because they provide a flexible framework that, in theory, respects diverse national participation but practically leaves critical interpretation power on resource rights firmly under U.S. control. The accords

[25] This comparative map was created by the author based on information from Map of Artemis Accords Signatories and International Lunar Research Station Participants, Map created by original author available at: https://www.presidency.ucsb.edu/documents/executive-order-13914; see also Map source: Map of Artemis Accords Signatories, by Wikipedia contributors via Wikimedia Commons, available at: https://www.presidency.ucsb.edu/documents/executive-order-13914 (accessed March 12, 2025).

lack binding dispute resolution mechanisms, undermining their legitimacy. Early signatory countries such as New Zealand and Luxembourg support including space resource discussions in broader international dialogues, but the accords do not clearly articulate their relationship with existing frameworks such as the Moon Agreement, potentially fragmenting the international space law system. The expansion of the Artemis Accords marks a pivotal moment in shaping space resource governance, and the legitimacy of this approach will ultimately be tested by the international community.

In essence, the agreement has inherent deficiencies in terms of international legitimacy and governance. Despite claiming consistency with international law, significant disputes exist regarding its legal effectiveness. Firstly, there is a contradiction between its non-binding nature and its credibility. Essentially, the agreement serves merely as a “non-binding declaration of principles,” lacking dispute resolution mechanisms and verification provisions. As a result, interpretative authority over key issues such as resource ownership remains predominantly in the hands of the United States. Secondly, there are limitations in representativeness. Of the 53 signatory countries, nearly 70% are traditional U.S. allies or nations with relatively weaker space capabilities. Major space-faring countries such as China and Russia have not participated, thereby weakening the global governance legitimacy of the agreement. Thirdly, there is the risk of regulatory fragmentation. Although early signatories such as New Zealand and Luxembourg support incorporating resource issues into international discussions, the agreement has not explicitly clarified its relationship with existing mechanisms like the Moon Agreement, potentially exacerbating the fragmentation of the outer space regulatory system.

The expansion of the Artemis Accords signifies a new stage in the competition for outer space resources, characterized by a “rule-based rivalry.” By blurring the boundary between multilateral cooperation and unilateral legislation, the United States is constructing a space governance system tailored to serve its strategic interests. However, the legitimacy and sustainability of this system remain subject to long-term scrutiny by the international community, especially by non-participating states.

2.2 Second Camp

2.2.1 Russia Advocates UN Agreement on the Ownership of Recovered Space Mineral Resources

Clarifying the ownership of mineral resources is a prerequisite for conducting management activities related to mineral resources. Most countries worldwide stipulate that mineral resources belong to the state. Regarding land ownership, Russian law separates land ownership from the ownership of mineral resources. According to Article 9 of the Constitution of the Russian Federation, “land and other natural resources may be under private, state, municipal, or other forms of ownership.” Article 1 of the Russian Federation’s Law on Subsoil states that “mineral resources within the territory of the Russian Federation, including underground minerals, energy, and other raw materials, belong to the state. Issues regarding the development, use, and management of resources are jointly managed by the Russian Federation and its constituent entities.” Regarding the right to use mineral resources, the law stipulates that “rights to use mineral resources may be transferred from one party to another under conditions permitted by federal law.”

As for the minerals extracted (mineral products), the law specifies, “under licensed conditions, extracted mineral resources and products may belong to the federal government or license holders, and the ownership may take the form of state, private, or other legally recognized ownership.” Thus, in Russia, mineral resources are owned by the state, while other entities can only possess usage rights within the legal framework [26]. Russia’s state structure, limited national economic revenue, and relatively weak commercial space industry market determine that it would not advocate unilateral legislation to grant private entities ownership rights over recovered space mineral resources. Instead, Russia seeks more influence through multilateral regulation via the United Nations system. The head of the Russian space agency

[26] Ou Junhua, “Research on Russia’s Mining Concession Taxes and Fees,” Space International, in Collected Papers of the 2014 National Environmental Resources Law Annual Conference (Part II), August 2014, pp. 59-62. （欧俊：《俄罗斯矿业特许税费研究》，载于《生态文明法制建设——2014 年全国环境资源法学研讨会（年会）论文集（第一册）》，2014 年 8 月。）

explicitly opposes unilateral national laws on the ownership of space mineral resources, arguing that such legislation is invalid without international consensus. Russia insists that outer space is a common asset of humankind, belonging equally to everyone on Earth, and thus calls for discussions under the UN framework regarding resource ownership. Furthermore, Russia has proposed establishing international regulations to manage and oversee mining activities in space.

2.2.2 China Has Not Officially Stated Its Position on Ownership of Recovered Space Mineral Resources

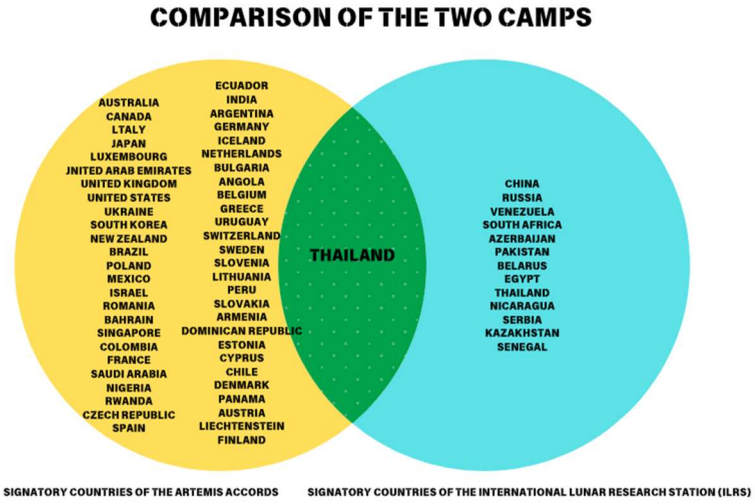
The Chinese government has not officially stated its position regarding ownership of recovered space mineral resources. However, based on national practice, it is evident that China exercises control and manages the distribution of lunar samples it has recovered. China's management and allocation of lunar soil clearly indicate that China has sole discretion over these resources. This practice suggests that China maintains indirect ownership rights over recovered space mineral resources and should accordingly assume international responsibilities, safeguarding the interests of other states.

Furthermore, according to China's 2016 White Paper on space activities, the Chinese government believes that peaceful exploration, development, and utilization of outer space and celestial bodies are equal rights enjoyed by all nations. China emphasizes that space activities conducted by all countries should contribute to peace, security, economic development, social progress, and the collective well-being of humanity. This indicates that China, like other nations, adheres to the principles of innovative, coordinated, peaceful, and open development in space.

Currently, there has been a noticeable shift among Chinese scholars regarding the ownership of recovered space resources. Initially, Chinese scholars adopted the position that space resources were the "common heritage of mankind," then moved towards classifying space resources as "common property," and further evolved to viewing them as "shared property." This shift implies that China shares some similarities with the United States concerning the exploitation and utilization of outer

space resources and benefit distribution. However, substantial differences remain: China prioritizes peaceful utilization, international coordination, openness, and fulfilling international obligations. In contrast, the United States adopts a stance characterized by absolute capitalist hegemony, taking no practical action to advance the common interests of humanity and consequently exacerbating international tensions regarding resource exploitation and benefit distribution.

Moreover, the United States' unilateral determination of ownership over space mineral resources has been opposed by many nations, reflecting the broader



international stance on this issue. For example, Russia has raised three clear objections: First, unilateral legislation by the U.S. violates existing international legal norms. Second, Russia emphasizes that COPUOS should start paying greater attention to activities involving outer space resources and provide legal regulation. Third, Russia believes that resources and celestial bodies share the same scope, both falling within the prohibited scope outlined by existing international treaties. Brazil holds a similar position to Russia, supporting the non-ownership standard for space resource mining activities. Belgium also opposes unilateral U.S. legislation due to concerns over potential global economic imbalance resulting from large-scale resource extraction. Belgium advocates establishing an orderly international legal system to regulate such

activities, not ruling out exclusive use of resources but insisting on clear and structured international governance.

Based on the map above, two distinct blocs have emerged in the realm of outer space cooperation: the International Lunar Research Station, led by China and Russia, and the Artemis Accords, led by the United States. This division reflects growing strategic competition in outer space. Most countries have chosen to align themselves with only one bloc, highlighting the intensifying geopolitical factors in outer space collaboration. Notably, Thailand is the only country to have signed both the Artemis Accords and joined the International Lunar Research Station initiative. Although the difference in signatory countries between these two agreements amounts to around 40 countries, it does not necessarily indicate a substantial disadvantage. Nevertheless, it underscores the intensification of geopolitical factors in space cooperation. Particularly given the uncertainty introduced into global stability by the second term of President Trump, who has continued to exclude Europe strategically, China should seize this opportunity to strengthen political and space cooperation with European countries. Consequently, major European space nations such as France and Germany, along with the European Space Agency (ESA), as well as countries from Latin America and selected African states, represent key groups that China and Russia must actively seek as strategic allies. Although the current situation is not equivalent to the Cold War era, the competition for allies in space governance is evident. Currently, both blocs share common objectives regarding outer space resource utilization and have shown a tendency to leverage the UN Committee on the Peaceful Uses of Outer Space (COPUOS). However, the bloc led by the United States under the Artemis Accords holds greater strategic advantages in terms of scale and diplomatic influence. While China and Russia have complementary strengths, their failure to gain broader international support may limit their negotiating power during future international discussions on space resource governance.

3. THE ISSUE OF THE LEGAL SYSTEM FOR THE OWNERSHIP OF THE RECOVERED SPACE MINERAL RESOURCES

The current international legal framework concerning the ownership of recovered space mineral resources contains significant flaws and loopholes. The unilateral national legislation enacted by countries such as the United States conflicts with the existing Outer Space Treaty regime. While unilateral actions could stimulate the establishment of international legal rules governing the exploitation of outer space resources, they are not conducive to the orderly and coordinated development of outer space activities. Furthermore, the existing Outer Space Treaty does not explicitly address space resource issues, leaving critical gaps concerning the ownership rights of extracted resources. This ambiguity exacerbates interpretive disputes and underscores the necessity for an internationally coordinated and structured legal regime. Without clear rules, the overly unilateral national approaches risk undermining the orderly and sustainable development of outer space activities[27].

3.1 Domestic unilateral legislation violates The Outer Space Treaty regime

Countries have different positions on the determination of the ownership of the collected space resources, so they have adopted different interpretations of the space law to support their positions. The existing domestic unilateral legal provisions violate the principles of non-self-ownership and common interest established by the Outer Space Treaties, as well as the principles of international cooperation[28].

First of all, unilateral legislation granting ownership of private entities violates the principle of common interest and the rule that it shall not be based on principles. According to the provisions of Article 2 of the Outer Space Treaty and the declarations of representatives of multiple countries during the negotiation process, the Treaty prohibits States and private entities from appropriating outer space resources as their own[29]. However, the United States and Luxembourg believe that this provision does not prohibit private ownership of the collected space resources. The recognition of

[27] Din, A. (2022). The Artemis Accords: The End of Multilateralism in the Management of Outer Space?. Astropolitics, 20, 135 - 150. https://doi.org/10.1080/14777622.2022.2144241.
[28] Yin Yuhai. The influence of the international legal system of outer space on my country's space legislation[J]. Local Legislation Research, 2019(6):2.)
[29] Zhao Yun, Jiang Shengli. An Analysis of the Legal Nature and Rights of Outer Space Resources——Concurrently Discussing the Construction of International Legal Mechanisms for the Development and Utilization of Outer Space Resources[J]. Exploration and Controversy,2018(05):85-91+143.

"private ownership" is only a one-sided interpretation of the literal meaning of Article 2 of the Outer Space Treaty, while ignoring the inherent logical relationship between Articles 2 and 6[30]. The State shall authorize the outer space resources collected by private entities, and at the same time be responsible for the outer space activities of private entities. Then the State can also legally own the ownership of the space resource through expropriation and paid purchase. This kind of unilateral legislation determines that the collected resources are privately owned, and the lack of recognition and supervision by other countries is a violation of the principle of non-self-containment and the principle of common interest and is not conducive to the orderly development of outer space resources[31].

Second, domestic unilateral legislation violates the principle of international cooperation under The Outer Space Treaty regime. The essence of international cooperation in outer space is the space policy coordination behavior of international actors in the field of outer space. However, various countries often formulate foreign space policies based on their interests. For its absolute interest in the space resource development market, the United States has passed domestic legislation to grant private entities the ownership of the collected space mineral resources. This is a violation of the principle of international cooperation in outer space treaties. Such unilateral legislation is incompatible with the policies and legislation of other countries. In addition, the United States implements a unified legal requirement for the ownership of above-ground land resources and underground mineral resources[32].

Obviously, the current domestic legislation in the United States is directly applicable in the field of space law and is not suitable for cooperation between various

[30] Yan Yongliang. On the legality of the unilateral commercial exploitation of celestial mineral Resources [J]. Local legislation research, 2019,4 (03): 111-126.
[31] Vylegzhanin, A., Yuzbashyan, M., & Alekseev, M. (2024). International Legal Outer Space Policy of the United States of America. International Trends / Mezhdunarodnye protsessy. https://doi.org/10.17994/it.2023.21.3.74.5.
[32] Qiao Siyuan. Research on the Legal System Of Mineral Resource Income Distribution In My Country[D]. Shanxi University, 2016.

countries in the field of space resource development, and it is also not conducive to the orderly development of space resources[33].

Finally, domestic unilateral legislation harms the interests of developing countries. The U.S. wants to dominate the order of space mining through first unilateral legislation and formulate a legal system of resource ownership that is conducive to its national development strategy. Even though the Presidential Decree on Space Resources and the Artemis Act promulgated by the United States this year seem to seek international cooperation, they implement the hegemonism of the United States in the exploitation of space resources. Whether other countries can participate in the exploitation of space resources, the initiative lies in the hands of the United States. Even if the United States advocates a supervisory system, it also tends to protect the interests of the U.S. government and private entities. Regarding the disposal of the rights of the collected space resources, the determination and supervision of how private entities dispose of the collected space resources to the State will be an internal matter within the State, and it will be difficult for other countries to interfere. The result of establishing resource ownership is not conducive to the long-term sustainable development of space resource exploitation, and it completely ignores the interests of developing countries.

3.2 Existing international laws and regulations are ambiguous

First, the relevant provisions of space law are lagging and broad. The principle of prohibiting self-possession in the Outer Space Treaty is not sufficient to prohibit the exploitation of outer space resources. Judging from the history of the expansion of the territory of human activities, the development of outer space resources cannot be prohibited. The "Outer Space Treaty" establishes broad principled restrictions on the exploitation of outer space resources, but specific systems are absent[34].

[33] Doktorant, Z., Łódzki, U., Prawa, W., Administracji, K., Międzynaro-Dowego, P., & Międzynarodowych, S. (2019). Recent USA outer space policy in view of public international law. Studia Prawno-Ekonomiczne. https://doi.org/10.26485/spe/2019/112/3.

[34] Stonis, D. (2022). Ambiguities in Space Law as Path towards Weaponization of Space: the Case of the Outer Space Treaty. Remarks on Regulation of Weaponization of Outer Space by Space Law. Copernicus Political and Legal Studies. https://doi.org/10.15804/cpls.20224.08.

It does not expressly mention the development of outer space resources, and it lacks the basis for protecting the property rights of outer space resources. At the same time, the benefit-sharing system for the development of outer space resources is also absent. In addition, the "Moon Agreement" is far from being universally accepted (or even being excluded) and has limited effectiveness in regulating the development of celestial resources[35]. But as soft space law, it has a certain inhibitory effect on determining the ownership of recovered outer space resources.

Second, the broad scope of application and principled language of the Five Outer Space Treaties have caused difficulties in application and interpretation. For example, Article 6 of the Outer Space Treaty allows private individuals to engage in outer space activities after approval, and commercial use of outer space is legal, which has been confirmed by State practice[36]. However, various countries currently have different opinions on whether the objects of "utilization" include outer space resources[37].

Whether the interpretation of the use is broad or not directly determines whether the government and private entities have the right to collect outer space resources. This is also one of the sources for determining the ownership of the recovered outer space resources under the treaty law.

Finally, the space law lacks systematic regulations to determine the ownership of the collected space mineral resources. Because the Five Outer Space Treaties lack provisions on the collected space mineral resources at the source, it is difficult to find the relevant space mining rights, the ownership of the collected mineral resources, and even the resource rights and priority provisions proposed by The Hague Space Governance Working Group. Therefore, if the conservative and limited space law regulations are to play a greater role, it is necessary to break through the existing system and introduce new rights and obligations, as well as new principles and

[35] Wu Xiaodan. Developing Outer Space Resources: Legality Of International Law, Institutional Trends And Countermeasures[J]. Manned Spaceflight,2019,25(4):552-560.
[36] Mehrani, A., Mirilavasani, S., & Heydarpour, M. (2023). Examination of the Status of Private Entities in the Government's Space Program in Light of International Space Law. Comparative Studies in Jurisprudence, Law, and Politics. https://doi.org/10.61838/csjlp.5.4.5.
[37] Wu Xiaodan. Developing Outer Space Resources: Legality Of International Law, Institutional Trends And Countermeasures[J]. Manned Spaceflight,2019,25(4):552-560.

concepts. However, from a practical point of view, the United Nations Legal Subcommittee can play a very limited role in determining the ownership of the collected mineral resources. The way it discusses issues to solve the current rapid development of space resource development is inevitably somewhat efficient, and it is also discussed within the United Nations system. It is difficult to reach a consensus.

Based on the above analysis of the legal defects in the ownership of the recovered outer space resources, it can be seen that domestic unilateral legislation is an inevitable trend, and a country will inevitably break the original Outer Space Treaty system and incorporate new rules and systems. Judging from the development trend of multilateral treaties and agreements in recent years, countries tend to adopt a more cautious attitude in the process of concluding new multilateral agreements. However, at a time when the international community is discussing the issue of ownership of outer space resources intensely, proposing to claim property rights or ownership of recovered outer space resources at present, it is the right time to propose to determine the ownership of the recovered outer space resources on multilateral occasions. Of course, when proposing to determine the ownership of resources, it is necessary to take into account the national security interests and the protection of the economic interests of the country and the people.

4. THE BASIC PATH TO PERFECT THE LEGAL SYSTEM FOR THE OWNERSHIP OF THE RECOVERED SPACE MINERAL RESOURCES

No single country can solely rely on its government's strength, traditional models, and national will to complete the development of outer space resources, the largest, longest time-consuming, and most technologically complex extraterrestrial expansion task in history[38][39]. Therefore, all countries should make concerted efforts to reach an international consensus on the ownership of outer space mineral resources as soon as possible. In particular, adopt an inclusive and flexible attitude in determining the

[38] Waldheim, K. (1969). INTERNATIONAL COOPERATION ON OUTER SPACE WITHIN THE U.N.. Annals of the New York Academy of Sciences, 163. https://doi.org/10.1111/J.1749-6632.1969.TB13054.X.
[39] America] Arthur M. Dulle, Zhang Zhenjun. Mineral Resources in Outer Space-Global Assessment of Challenges and Opportunities[M]. Beijing: China Aerospace Publishing House, 2017.

ownership of recovered space mineral resources. While ensuring a proportional return on investment, guarantee the participation rights of future investors, and balance the interests of related parties from multiple perspectives in the distribution of ownership and benefit distribution, seeking common ground while reserving differences.

4.1 The domestic legal system should abide by The Outer Space Treaty regime

4.1.1 Do not adopt unilateral legislation and actively seek international consensus

At the 56th Committee of the Legal Subcommittee of COPUOS, China stated its position on the exploration of potential legal models for space resources. The first is to adhere to the existing legal framework, purpose, and spirit of the outer space field, and to ensure the free exploration and use of space by all countries. Resources and such freedom should be limited by provisions such as "serving the welfare and interests of all countries", "not appropriating for one's possession", "peaceful use", and "properly taking care of the equal interests of other contracting states". The second is to take into account the relationship between free use and fair sharing of benefits, as well as the long-term rational use of space and environmental protection[40].It can be seen from this that China has a relatively neutral and principled attitude towards the development of outer space resources, and has not stated its position on the ownership of the recovered outer space resources. However, as a leader in the development of outer space resources, China's aerospace policy of "hiding our capacities and biding our time" has not adapted to the current development. In the international community, especially in the United Nations Committee for Outer Space Affairs, China needs to have a firm voice in the legal system for the development of outer space resources. At the same time, China needs to find more strategic allies to gain more in the process of formulating international space law rules, the support, and recognition of its space law, to give play to its leading role in the formulation of space law rules.

[40] The Delegation Of The People's Republic Of China To The United Nations And Other International Organizations In Vienna. China Has Established [EB/OL]. (2017-3-30) [2025-2-28].

The pandemic of the new crown epidemic has accelerated the transformation of the world order. Under this wartime economy, it has not reduced the fierce competition among the space powers in the deep space field. This is both an opportunity and a challenge for China. In determining the ownership of the recovered space mineral resources, China should state its national position promptly, instead of adopting a delay strategy, and actively use the Belt and Road Initiative to develop cooperation in the deep space field with countries in Europe, Asia, and Africa to seek international consensus.

4.1.2 Domestic legislation should abide by the principles of international cooperation under The Outer Space Treaty regime

Articles 1, 3, 9, and 10 of the Outer Space Treaty all stipulate international cooperation. At the same time, the principle of international cooperation is more embodied as a substantive principle, which has the guiding and leading role of general principles[41]. China should promptly emphasize the violation of the principles of international cooperation in unilateral legislation by the United States and other countries at international conferences, and at the same time advocate for the establishment of space resource rules based on extensive consultation, joint construction, and sharing. In addition, the different nature of the ownership of mineral resources in various countries is one of the reasons why countries cannot reach a consensus on the ownership of the recovered space mineral resources[42].

Some countries directly extend the domestic mineral resource management system to outer space resource management. This is a manifestation of the State deliberately pursuing hegemonism in the resource management system, completely ignoring the interests of other countries, and even harming the outer space resource mining order. As far as China is concerned, in determining the ownership of recovered outer space resources, it should listen to other countries' cooperation demands,

[41] Yin Yuhai. The influence of the international legal system of outer space on my country's space legislation[J]. Local Legislation Research,2019(6):2.
[42] Qiao Siyuan. Research on the legal system of mineral resource income distribution in my country[D]. Taiyuan: Shanxi University, 2016.

actively ensure that domestic legislation and space law can be harmonized, and grant countries or private entities the exploitation and use of space through international treaties or international laws.

4.1.3 Balance the interests of various countries to determine the ownership of resources

The reason why the development of outer space resources can become the area of outer space activities that countries are most concerned about is directly related to the major economic benefits that can be generated by their development. The issue of determining the ownership of recovered outer space resources promoted by the United States and Luxemburg essentially only represents the interests of major space powers. Peaceful use and orderly exploration have always been the eternal theme in outer space[43].Therefore, in the process of determining the ownership of recovered resources, China and the United States have common interests in the exploitation and ownership of outer space resources.

The transfer and circulation of resources all need the protection of international law. Additionally, the author disagrees with the position held by some scholars, who advocate delaying or restraining private exploitation of outer space resources by commercial entities in the United States[44].

On the contrary, the author believes that the faster the United States moves forward with commercial extraction and utilization of outer space resources, the sooner the international community will be prompted to discuss and negotiate an international legal framework for outer space resource activities, ultimately fostering the emergence of a clearer and more structured global governance regime in this domain[45].The United States' unilateral initiatives in space policy decision-making have historically encountered relatively less resistance due to its influential position within the United

[43] Wang Jin. On The Improvement Of The International Legal System For The Development Of Outer Space Resources[D]. Xiangtan: Xiangtan University, 2019.
[44] Nyka, M. (2018). Legal prerequisites of the management of natural resources of the Moon and other celestial bodies. Molecular Microbiology, 199-207. https://doi.org/10.21272/MMI.2018.3-17.
[45] Ünüvar, G., & Su, X. (2024). International Legal Governance of Space Resources and the Role of National Frameworks: The Case of China. Chinese Journal of International Law. https://doi.org/10.1093/chinesejil/jmae024.

Nations Committee on the Peaceful Uses of Outer Space (COPUOS). As a result, China has often been placed in a comparatively disadvantaged position regarding the formulation of international space governance rules[46]. The author argues that it is imperative for China to clearly articulate its stance on the formation of international rules governing outer space resource development[47].

By proactively expressing its position, China can not only protect its national interests but also contribute to shaping balanced and equitable international rules[48]. Moreover, clarifying its standpoint on the legal status of recovered outer space mineral resources will enhance the stability and predictability of the international legal framework, thereby providing a conducive environment for the growth of China's commercial aerospace sector and attracting broader international cooperation and support.

4.2 The international legal system should be innovative and tolerant

Only by advancing with the times can any rule maintain its life and vitality. The Outer Space Treaty regime established during the US-Soviet competition for hegemony has long been unable to guarantee the development of space activities[49]. At present, The Outer Space Treaties urgently needs to introduce new rules and concepts to realize the scientific and effective management of outer space resources[50]. Therefore, countries should respond to multilateralism, to adopt a more tolerant attitude.

4.2.1 The primary right of the recovered outer space mineral resources should belong to the State

[46] Li, B. (2020). China's Policy and Rule-Making Activities on Outer Space: The Case of Preventing Arms Race from the Global Commons Perspective. International Community Law Review, 22, 589-612. https://doi.org/10.1163/18719732-12341448.
[47] Tutnova, T. (2023). China and the Mechanisms of International Legal Regulation of Space Activities. Теория и практика общественного развития. https://doi.org/10.24158/tipor.2023.12.46.
[48] Yedeliev, R., & Spivak, V. (2024). THE ROLE OF CHINA IN CONTEMPORARY INTERNATIONAL LAW. Actual Problems of International Relations. https://doi.org/10.17721/apmv.2024.160.1.79-83.
[49] Moltz, James Clay. "7. Trends and Future Options". Crowded Orbits: Conflict and Cooperation in Space, New York Chichester, West Sussex: Columbia University Press, 2024, pp. 189-214. https://doi.org/10.7312/molt20706-009
[50] Ispolinov, A. (2020). International space law of the era of the beginning of the business colonization of space. Meždunarodnoe pravosudie. https://doi.org/10.21128/2226-2059-2020-4-22-44.

With the help of the United Nations Space Law Committee, it is determined that the first right holder of the recovered space mineral resources, is the country. As far as the State is concerned, according to Article 6 of the Outer Space Treaty, the State is responsible for the activities of private entities in outer space[51], and the State also needs to authorize the activities of private entities in outer space and protect the private entities. In addition, the State must also supervise the activities of private entities in the mining process. As far as private entities are concerned, domestic legislation directly grants them the right to collect space mineral resources, but they do not need to bear international responsibilities and perform international obligations.

In addition, domestic legislation grants private entities the ownership of collected space mineral resources, and it cannot be ruled out that the State has indirect ownership of such resources. Since the rules cannot rule out that the State may have ownership of the collected outer space resources, it can be directly given legitimacy in the rules. That is to say, the State is given the first rights to the collected outer space resources. Only in this context can private entities claim exclusive property rights over the collected outer space resources.

The basis for this is (1) Private entities are not subjects of mainstream international law for outer space development. At present, private entities are the subject of international law in some special circumstances, and there is no international legal basis for private ownership of the recovered space mineral resources, and no country expressly stipulates that non-governmental entities are obliged to abide by the Outer Space Treaty, not to mention the recovery of the space mineral resources of China are special international mineral resources.

Therefore, private individuals cannot claim ownership of international minerals without the basis of international law. However, if the State has ownership or property rights over the recovered space mineral resources, then private individuals can claim the recovered space minerals under the authorization of the State. This ownership can

[51] Article 6 of the Outer Space Treaty stipulates: “Each State Party shall bear international responsibility for its own activities in outer space, including the Moon and other celestial bodies, regardless of whether such activities are carried out by government agencies or non-government groups. And it shall bear international responsibility to ensure that domestic activities comply with the provisions of this treaty".

be full, and the space mineral resources recovered at this time are circulated under national supervision and authorization.

This type of "returned mineral resources" is no different from the physical rights of domestic circulating mineral resources, but is more stringent in terms of procedural management. (2) All countries participating in the circulation of this type of international mineral resources should mutually recognize the ownership or property rights of the recovered space mineral resources. As for ownership of property rights, each country needs to reach a consensus and form a general interpretation.

By determining that the country has the source rights to the recovered space mineral resources, it is ensured that the future reform of the space mineral resource property rights system will not be subject to private entities. Only when countries hold the control rights over the recovered space mineral resources can the recovery be guaranteed. The circulation of space mineral resources in China is regulated and supervised by the State, which can also maximize the role of the market economy.

4.2.2 Determining the ownership of recovered space resources in the United Nations system

The UN Committee on Outer Space Affairs is the specialized agency of the United Nations responsible for outer space affairs[52]. Its purpose is to formulate principles and regulations in the field of outer space and to study legal issues that may arise in outer space activities. Since its establishment, COPUOS has drafted and submitted several declarations, principles, and conventions for adoption by the United Nations[53].

Among them, Greece and Belgium formally proposed to establish a working group in the Legal Subcommittee to discuss the rules of space resource development during the meeting of the Legal Subcommittee in April 2017[54].

[52] The full name is the United Nations Committee on the Peaceful Uses of Outer Space, which was established in 1959 in accordance with UN General Assembly Resolution 1472.
[53] Cai Gaoqiang. Special Research on the Theory and Practice of the Development of Space Law in China [M]. Beijing: Law Publishing House, 2019:105.
[54] Wang Guoyu, Ma Dongxue, Wang Ruijuan. First step in the "Draft International Framework Text" negotiations on progress in —— towards international legal certainty in outer space mining [J]. International Space. 2017(12).

The Legal Subcommittee of the United Nations Outer Space Commission discussed the legal issues related to the exploration, development, and utilization of space resources at the 57th session (2018). Belgium also raised several questions regarding the private ownership of recovered outer space resources in the US Space Resources Act of 2015[55]:

(1) If recycling is a form of use, does this provision implicitly exclude the non-commercial use of space resources?

(2) The provisions are limited to U.S. citizens; so can non-U.S. citizens enjoy the benefits of this clause?

(3) How to solve the problem of personal rights obtained by foreign citizens under the laws of the country?

(4) Does this recognition require a (bilateral) treaty?

Determining the ownership of outer space resources has become a very urgent and necessary international issue, which affects the major interests of space powers and private entities in the deep space field. All countries attach great importance to this issue. The author believes that it is possible and feasible to discuss the issue of changing the ownership of resources in the United Nations system.

4.2.3 Integrate the concept of a community with a shared future for mankind into the determination of resource ownership

The vision of a community with a shared future for outer space is in line with the goals and objectives of the United Nations' Outer Space Treaty, such as "exploring and using outer space for the welfare and benefits of all countries", and it is also compatible with protecting the outer space environment, promoting outer space activities, and social economy. The contemporary needs of sustainable development reflect the universal demands of the international community[56].

[55] Working paper prepared by Belgium. Questions and observations by Belgium on the establishment of national legal frameworks for the exploitation of space resources[EB/OL].Committee on the Peaceful Uses of Outer Space Legal Subcommittee Fifty-seventh session.(2018-3-29)[2025-3-12].https://www.unoosa.org/res/oosadoc/data/documents/2018/aac_105c_22018crp/aac_105c_22018crp_8_0_html/AC105_C2_2018_CRP08E.pdf.

[56] Huang Kun. Towards The Sea Of Stars With China-The United Nations Outer Space Committee Meeting Pays Attention To The Chinese Space Station And Beidou System[EB/OL]. (2019-06-14). [2025-2-28]

In today's world, even for a certain superpower, pursuing the hegemony or "empire" model cannot escape the reality of being restrained[57]. And the whole world is regarded as "a Community of Shared Future for Mankind[58] ", that is, when pursuing the interests of one country, taking into account the reasonable concerns of other countries, and seeking the development of the country to promote the common development of all countries in the mainstream.

The outcome document adopted by the high-level meeting to commemorate the 50th anniversary of the United Nations Conference on the Exploration and Peaceful Use of Outer Space held in 2018 adopted China's proposal, calling for "strengthening international cooperation in the field of peaceful uses of outer space to realize the vision of a community with a shared future", for the welfare and benefit of all mankind"[59].

The concept of a community with a shared future for mankind pays more attention to the integration of self-interest and other interests in international exchanges, which is more in line with the trend of outer space activities from unilateral hegemony to common use in the new era and can further enhance the activities of developing countries in human outer space. And the sense of participation and gain in space legislation to ensure that the new international law order for the allocation of outer space resources is recognized and supported by the vast number of Asian, African, and Latin American countries[60].

Therefore, the determination of the ownership of the recovered space mineral resources should recognize the great contributions of developed countries in exploring the deep space field, and at the same time recognize and respect the reasonable pursuit of national self-interest by countries to ensure that the new distribution order

[57] [America] John H. Jackson. National Sovereignty And The Foundation Of International Law in WTO Changes[M]. Beijing: Social Sciences Archives Press, 2009:305.
[58] Huang, S. (2023). The responds on building a community with a shared future for mankind. Journal of Political Science Research. https://doi.org/10.23977/polsr.2023.040305.
[59] Huang Kun. Towards The Sea of Stars With China-The United Nations Outer Space Committee Meeting Pays Attention To The Chinese Space Station And Beidou System[EB/OL]. (2019-06-14). [2025-2-28]
[60] Froehlich, A., Soria, D., & De Marchi, E. (2020). Latin America's Space Legal Framework. , 101-142. https://doi.org/10.1007/978-3-030-38520-0_5.

will not be resisted because it harmed the reasonable interests of developed countries[61].

The author argues that, as the concept of "a community with a shared future for mankind" continues to evolve and gain broader international acceptance—particularly among Asian, African, and Latin American countries—its influence on international rule-making will become more profound. Consequently, integrating this concept into the management regime for recovered outer space resources is likely to promote widespread international consensus regarding the determination of resource ownership[62].

4.2.4 Introduce the mutual recognition system of property rights and resource priority or a new market management mechanism

Abandoning the concept of ownership when there are not enough alternative concepts can lead to pure power supremacy, which in turn can lead to confusion, misunderstanding, and conflict[63].Therefore, the non-ownership ownership proposed by scholars of various countries for the recovered space mineral resources urgently needs to be expanded and enriched, to avoid the hegemony of the space powers, but also to avoid the supremacy of power and the conflict of rights.

4.2.4.1 Introduce a system of mutual recognition of property rights

Recognition is political, and at the same time recognition is also a legal act. Recognition in international law refers to the confirmation that an existing country has a legal effect on entities such as a new country, a new government, or a certain type of group[64].

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[61] Wang Jin. On the International Law Order of the Distribution of Rights and Interests in the Development of Outer Space Resources: From the perspective of the concept of a community of shared future for mankind[C]. Shanghai Law Society, 2019(9).
[62] Cui, H. (2024). The integration and transcendence of the concept of a community with a shared future for mankind and global governance. Journal of Infrastructure, Policy and Development. https://doi.org/10.24294/jipd.v8i8.6720.
[63] America] John H. Jackson. National sovereignty and the foundation of international law in WTO changes[M]. Beijing: Social Sciences Archives Press, 2009:305.
[64] Encyclopedia of Chinese Adult Education. Recognition in International Law [EB/OL]. CNKI Reference Book Library. [2025-2-28] http://gongjushu.cnki.net/RBook/Detail?entryId=R2006090640001418.

Recognition is an act of State, indicating that the recognizing country is willing to interact with the recognized country. However, the recognition of the collected space mineral resources is different from the recognition in international law. In response to this, Article 7 of The Hague Space Governance Working Group's "Development Elements of the International Framework for Outer Space Resource Activities (Draft)" stipulates that "the international legal framework shall enable the subject of space activities to legally obtain the property rights of the outer space resources and related outer space products that they have exploited[65].

Countries can recognize such property rights through mutual recognition." The key to this provision is that through mutual recognition and recognition of the "rights to exploited space resources", the State can grant private individuals such property rights through legislation; secondly, such rights granted by domestic law cannot logically be recognized by the international community, it is internationally recognized based on mutual acceptance and agreement between countries.This system of mutual recognition of resource rights can not only solve the problem of coherence between international law and domestic law but also benefit the mutual recognition of countries to reach a consensus. Once countries have formed a "consensus mechanism", they can promote the full participation of other countries in the development of space resources, and at the same time increase the transparency of the mechanism[66].

The author believes that this enhances the legal enthusiasm of countries to exploit outer space resources and avoids development through mutual recognition on a local scale. The voices of opposition from China ensure the accurate implementation of the aerospace commercialization strategy and prevent unfavorable voices from countries that hinder the exploitation of space resources.The recognition of the rights of the collected space resources can be either express or tacit recognition. Explicit recognition can be used to formally express the meaning of recognition through declarations, statements, notes, bilateral and multilateral treaties, and other

[65] Xu, F., & Su, J. (2020). New Elements in the Hague Space Resources Governance Working Group's Building Blocks. Space Policy, 53, 101386. https://doi.org/10.1016/j.spacepol.2020.101386.
[66] [America] John H. Jackson. National sovereignty and the foundation of international law in WTO changes[M]. Beijing: Social Sciences Archives Press, 2009:305.

languages[67]. Implied recognition is the expression of recognition in actual exchanges, such as maintaining or establishing diplomatic relations, and concluding bilateral treaties[68].

Through the recognition of these two methods, the scope of countries for mutual recognition can be expanded, and then the influence of the "property rights of collecting space resources" can be expanded, so that other countries and private entities can benefit from the development and utilization of outer space resources. This also embodies the principle of "a common destiny for mankind".

4.2.4.2 Introduce a new market management mechanism

Chinese scholars suggested in the Working Group on Outer Space Resources Governance in The Hague to amend "exclusive rights" to "priority rights." There are two reasons for this. First, from the perspective of law and economics and a neutral standpoint, the rules that can generate the right incentives are good. Without rights, guarantees, or commitments, planetary mining activities that require a large amount of investment cannot develop in an orderly and healthy manner, regardless of whether the main body is a State or a private person.

The second is that any country with mining potential or demand must have the right to demand the space resources it will exploit in the future. Directly stipulated as "exclusive rights" can easily lead to legal and political disputes, and "priority rights" not only include rights commitments, but also reserve room for mutual compromise for subsequent international legal and political disputes[69]. The author agrees with this view, which on the one hand eases the conflicts that may be triggered by the "two camps", and at the same time makes it possible for the international community to accept this new "rule of international law."

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[67] Campo, M., & José, A. (2021). Finders Keepers. Texas A&M Journal of Property Law. https://doi.org/10.37419/JPL.V7.I2.3.

[68] Ker-Lindsay, J. (2015). Engagement without recognition: the limits of diplomatic interaction with contested states. International Affairs, 91, 267-285. https://doi.org/10.1111/1468-2346.12234.

[69] Wang Guoyu, Ma Dongxue, Wang Ruijuan. Progress in the negotiation of the "Draft International Framework Text" of the Working Group on Outer Space Resources Governance in The Hague——The first step towards the certainty of the international law of outer space mining[J]. 国际空间.2017(12).

According to its legal nature, on the other hand, it also fully takes into account the interests of the actual development and operators of outer space resources. Therefore, the introduction of priority in determining the ownership of recovered outer space resources will not only guarantee the rights of operators but also open the door for subsequent developing countries to join in the development and use of outer space resources.

As for the content and scope of the priority right, it is still difficult to conclude, but the right should be open and inclusive, and it is best not to restrict the application objects to ensure the vitality of the right. Of course, to determine the priority of resources, it is necessary to clarify the prerequisites. It is clear that the country does not claim sovereignty over outer space resources and does not claim ownership of resources in outer space.

On this basis, the country can claim property rights over the collected space mineral resources, provided that a multilateral consensus is formed. It may be illegal to claim rights unilaterally. Under the premise of resource priority, while ensuring that the benefits of resources will benefit developing countries, it is proposed that the government has national property rights to the recovered outer space resources.

The definition of this kind of property rights needs to focus on and claim ownership of the collected outer space resources. By granting national property rights to the recovered space mineral resources, the following problems can be solved:

(1) Avoiding opposition from the international community for claiming ownership of the recovered outer space resources;

(2) Ensuring China's role in the construction of the outer space mining mechanism leading power to protect the interests of developing countries;

(3) Use this concept to balance the relationship between international and national as well as private and mineral resources. In the process of enriching the connotation of resource priority, it is necessary to emphasize the resource benefit-sharing mechanism to obtain the support of most countries for our China.

4.2.4.3 Introduce a new market distribution mechanism

The absence of private property does not mean that there is no market. For the determination of resource ownership and benefit distribution, it is necessary to introduce a new distribution mechanism. Through the effective distribution of resources by the market, partial ownership is given to resource owners to achieve the balance of space resource ownership allocation and benefits[70].

The Harberger license[71] is a partial ownership system that allows public products and government-owned natural resources to be exposed to market dynamics for distribution while retaining investment incentives for current owners and preventing monopoly or lock-in resources. Under such a system, resource owners can assess the value of their property by themselves and pay taxes in proportion. If the buyer is willing to purchase the goods at the owner's self-assessed price, the owner must cede the goods to the buyer.

No owner can cede property without paying the price he considers appropriate, otherwise, he can file a counterclaim, requesting the owner to increase the value of his assessment to protect the owner.

Glen Weyl E named this tax "Common Ownership Self-Assessment Tax (COST)"[72] [73]. This permanent auction system ensures that those who value the property the most can always benefit from it. Such a system does not conflict with the Outer Space Treaty.

First, no country or private entity can possess or claim sovereignty: everything still belongs to the international community (managed by space resource management agencies). This is just a structure for allocating the use of space resources, and it relies on a small amount of taxation to introduce market dynamics.

[70] Erwan Beauvois, Guillaume Thirion. Partial Ownership for Outer Space Economy[J]. Astronautics Science and Technology, 2020. https://doi.org/10.1007/s42423-019-00042-0.
[71] Eric A. Posner, E. Glen Weyl. Radical markets: uprooting capitalism and democracy for a just society[M]. Princeton University Press,2018(5).
[72] Chen, W., & Mei, C. (2022). Research on the evaluation model for fair distribution of space resources in the future. 2022 5th International Conference on Data Science and Information Technology (DSIT), 1-5. https://doi.org/10.1109/DSIT55514.2022.9943813.
[73] Beauvois, E., & Thirion, G. (2020). Partial Ownership for Outer Space Resources. Advances in Astronautics Science and Technology, 1-8. https://doi.org/10.1007/s42423-019-00042-0.

This tax benefits all those who accept the payment because they are also shareholders of the space resource management agency, the entity that collects these taxes. There is no private property and therefore no exclusive right. As stated in the Outer Space Treaty, if everyone does not cause potentially harmful interference to the activities of others, then everyone has free access to all areas of outer space.

The current owner can prevent others from using the property in the name of harmful interference, but everyone can still freely obtain the right to use the property, so there is no real exclusivity.

4.2.5 Constructing a space resource management system centered on national property rights

Domestic mining is a management legal system built with mining rights as the core, but for international minerals such as recovered space mineral resources, according to Article 2 of the Outer Space Treaty, States and private entities cannot claim ownership of outer space resources. According to the theory of good faith interpretation of the Outer Space Treaty, States and private entities can claim ownership or property rights over collected space resources. In this regard, the author proposes that the legal nature of the recovered space resources should be positioned as the State's property rights to it.

Although the domestic mining rules are essentially different from the international mining rules, the management of mineral resources in various countries has great enlightenment and reference significance for the construction of international rules.

The theory and practice of the "Mining Law" in various countries has proved that the mining law is the mining rights law, mainly the law of the operating rules of the mining rights[74].

This enlightenment for the construction of international rules is that the international community can build the management of outer space resources based on the property rights of space mineral resources.

[74] Environmental Law Institute of Wuhan University. Review and Prospect of China's Mineral Resources Rule of Law Construction[EB/OL]. (2018-11-7) [2021-5-31]. International Environmental Protection Online.

Since the property rights of the recovered space mineral resources are related to national security and national economic interests, the State and private entities need to comply with relevant space law and international law obligations and be supervised in the acquisition and transfer. In addition, when the recovered space mineral resources are internationally registered, and after the private person obtains the ownership of the resource with the permission of the government, the private person obtains the private right of the space resource at this time, that is, the exclusive right of control and the government shall not infringe it at will.

However, the ownership at this time is not absolute. Taking into account the particularity of the recovered space mineral resources, the State has the right to immediately recall such resources if improper handling of the resources results in pollution of the earth's environment or personal injury[75].

In addition, the space asset management system should stipulate the method of obtaining national space resource property rights, and at the same time, it can guide each country's domestic laws on the way of space resource circulation systems through international general rules[76].

For instance, explicit international mechanisms should clearly define how collected outer space mineral resources are distributed or allocated among states and private entities, specifying precisely which categories of recovered space resources may be tendered, auctioned, traded, or listed on markets[77] and which resources should be allocated through alternative means such as priority rights or prior application methods, thereby ensuring legal certainty, efficient allocation, and equitable benefits[78].

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