The Multi-Level System of Space Mining: Regulatory Aspects and Enforcement Options

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Abstract

Few contests that space resource activities hold the potential to revolutionize the space sector. Whether this revolution will be for good or for worse also depends on how these activities will be regulated. Under the right framework, space resource activities can certainly deliver on their promise of a new era of prosperous and sustainable space exploration. But with the wrong rules (or lack thereof), they can destabilize the space community to an unprecedented scale that might seriously compromise the peaceful and cooperative uses of outer space.

This paper provides a highlight of the key findings developed by the author after four years of specialized research on the governance of space mining. First, the paper presents fundamental boundary conditions and open questions posed by the applicability of the OST to space mining. Second, the paper discusses the enforceability of existing national and international norms related to space mining. Finally, the paper proposes two correctives that can help stabilize the system and ensure the safe, sustainable, rational and peaceful conduct of space mining.

1. Introduction

We praise outer space as a special domain. Space activities are carried out in a three dimensional, transparent and continuous medium. By their very nature, they are international, global and even extra-terrestrial.[1] This is especially true for space resource activities, new endeavours that promise to revolutionize space exploration in the years to come.

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1 Pablo Mendes de Leon, Crossing Borders in International Air and Space Law, 3 (1) India Law Journal, 2-3 (2010).

After the discovery of significant quantities of water ice in the Lunar south poles,[2] space mining captured the interest of public and private actors interested in the opportunities offered by the development of the Moon. With several stakeholders planning to begin their mining operations already during this decade,[3] the regulation of space resource activities rapidly became one of the most important topics of international space law. The level of global attention started to raise in the year 2015, after the United States (US) passed the first example of domestic legislation allowing privates to engage in the recovery and use of space resources.[4] Over the following six years, other three Countries – Luxembourg, the United Arab Emirates and Japan – have enacted similar laws to attract the growing interest of commercial operators worldwide.[5] Today, a total of 20 Countries supports the utilization of space resources for safe and sustainable space activities as crystallized in Section 10 of the "Artemis Accords", a political commitment to principles for cooperation in the civil exploration and use of celestial bodies for peaceful purposes.[6] In parallel to these developments at the national level, the Legal Subcommittee of the UN Committee on the Peaceful Uses of Outer Space (COPUOS) has also turned its attention to the governance of space resource activities. Between the years 2016 to 2021, the LSC first adopted an agenda item dedicated to "general exchange of views about potential legal models for activities in exploration, exploitation and utilization of space resources" and then established a working group on the "legal aspects of space resource activities" (UNSRWG).[7] In 2022, the UNSRWG approved an ambitious workplan that in just five years may lead it to develop *a set of initial*

2 As reported online by NASA (accessed September 2022).

3 Bryce Space, Projected Exploration Missions (2020-2030), available online (accessed September 2022).

4 Commercial Space Launch Competitiveness Act *entered into force* Nov. 25, 2015, H.R.2262, 114th Congress (2015-2016)

5 Respectively: for Luxembourg, the Loi du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace, *entered into force* Jul. 28, 2017, Lux Recueil de Legislation A674 (2017); for the UAE the Federal Law No. 12 of 2019 on the Regulation of the Space Sector, entered into force Jan. 20, 2020, 669 UAE Official Gazette 111 (2019); and for Japan: Space Resources Act, entered into force Dec. 23, 2021, 141 Japan Official Gazette 4 (2022).

6 The Artemis Accords - Principles For Cooperation In The Civil Exploration And Use Of The Moon, Mars, Comets, And Asteroids For Peaceful Purposes, available online. The updated list of Signatories can be found online (both links accessed September 2022).

7 See, respectively, "Resolution adopted by the General Assembly at its 71st Session, *International Cooperation in the Peaceful Uses of Outer Space,* UN Doc. A/RES/71/90 (2016)" and "Report of the Committee on the Peaceful Uses of Outer Space on its 64th Session, held in Vienna from August 25th to September 3rd, UN DOC A/76/20 53 (2021)".

recommended principles aimed at ensuring the *safe, sustainable, rational and peaceful conduct* of space mining in accordance with international law.[8]

As noted in the mandate of the UNSRWG, like all activities in the exploration and use of space, also space mining will have to be conducted in accordance with international law and in particular with the provisions of the Outer Space Treaty (OST),[9] the *Magna Carta* of international space law. While the overall applicability of international law is a reassuring factor for maintaining peaceful discussions, the reality is that the OST is a *treaty on principles* that can be interpreted in many ways. One might even argue that the OST provides the interpreter with perhaps *too many* options, depending on preferred balancing choices and methods of interpretation. As a result, we are facing a regulatory *impasse* that if left unattended may impede the prosperous uses of celestial bodies.

Ove the past four years, this author has conducted an in-depth analysis of the multi-level governance of space mining, with special focus on its regulatory aspects and enforcement options. This paper presents key findings from this research discussing the current regulatory status of space mining, including the enforceability of existing national and international norms. Finally, in the third section the paper proposes two concrete correctives that can help stabilizing the system and ensure the safe, sustainable, rational and peaceful conduct of space resource activities.

2. The Multi-Level Regulation of Space Mining

In international law, a regulatory system is considered to be multi-level if both national and international regulators can contribute to its development. In the case of space law, this is determined by the combination of two fundamental provisions of the OST, Article I and Article VI. International law provides the boundary conditions shaping the exploration and use of space, while domestic law implements and builds upon these conditions to (primarily) govern the space activities of national entities (both public and private).[10] After almost sixty years of developments, the rules of international space law are now codified in the *Corpus Iuris Spatialis,* a set of five international treaties – the OST, the Rescue and Return Agreement, the

8 Report of the Chair and Vice-Chair of the working group established under the Legal Subcommittee agenda item entitled "General exchange of views on potential legal models for activities in the exploration, exploitation and utilization of space resources", UN DOC A/AC.105/C.2/2022/SRA/L.1, p. 1 (2022)

9 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *entered into force* Oct. 10, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter: OST].

10 Tanja Masson-Zwaan, *Article VI of The Outer Space Treaty and Private Human Access To Space,* 2008 (9) Proceedings Of The International Institute Of Space Law 537 (2008).

Liability Convention, the Registration Convention and the Moon Agreement[11] – and a variety of Resolutions of the UN General Assembly. Building upon these foundations a total of 36 States so far enacted national space legislation to regulate the space activities of their nationals and implement the principles of international space law.[12]

This multi-level structure stands valid also for the regulation of space mining. Even though there are no provisions in the OST specifically addressing the conduct of space resource activities, this does not mean that they are forbidden or, on the other hand, that they can be unilaterally regulated at the domestic level. Truth to be told, the OST does not mention *any* space activity at all. Nowhere in the Treaty one could find references to activities such as Earth observation, remote sensing, navigation or telecommunications, and yet there is no doubt that they are allowed under, and thus governed by, the OST. The freedoms of space have been framed in broad terms exactly to allow for the conduct of all kinds of space activities, present and future, with the exclusion of those forbidden by Treaty.[13] For what concerns space mining, existing State practice in the recovery and use of lunar and asteroid resources[14] shows that this activity is allowed as part of the freedom to use celestial bodies and that it does not fall under the scope of the prohibition to appropriate their territories.[15] Naturally, the permissibility of space resource activities does not mean that *any form of mining* would necessarily be legal. Commercial space mining is a case in point. Under Article VI OST, States are obliged to assure that private entities engaged in space mining conduct it in

11 In order of citation: agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, entered into force Dec. 3rd 1968, 672 UNTS 119; Convention on International Liability for Damage Caused by Space Objects, entered into force Oct. 9, 1973, 24 U.S.T. 2389, 961 U.N.T.S. 187; Convention on Registration of Objects Launched into Outer Space, entered into force Sep. 15, 1976, 28 U.S.T. 695, 1023 U.N.T.S. 15; Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, entered into force July 11, 1984, 1363 UNTS 3.

12 As reported online by UNOOSA at the time this this was finalized (accessed September 2022). For a comprehensive assessment of the most prominent national space legislations, *see* Ram Jakhu (ed.), National Regulation Of Space Activities (2010).

13 P. J. Blount, *Innovating The Law: Fifty Years Of The Outer Space Treaty*, In Innovation In Outer Space: International And African Legal Perspectives 34 (Mahulena Hofmann & P. J. Blount Eds 2018).

14 For an overview of some of these missions *see* Allan Treiman, Sample Return From The Earth's Moon, available online, as well as the overview provided by the US National Academies of Sciences, Engineering and Medicine (both links accessed May 2022).

15 Mahulena Hofmann, *Space Resources: Regulatory Aspects,* in Innovation In Outer Space, book cited *supra* note 13 at pp. 202 – 203. P.J. Blount, *Outer Space and International Geography: Article II and the Shape of the Global Order,* 52 (2) New England Law Review 102 -103 (2018).

conformity with the provisions of the Treaty. As a result, the margin of discretion of domestic regulators is limited by the outcome of the multilateral debate on the governance of space mining. This close link between multilateral and domestic processes reinforced the multi-level nature of space mining to the point of determining an actual regulatory *impasse*.
To better understand and hopefully help advance the debate, over the past four years this author thoroughly studied the OST to understand the boundary conditions and open questions that can be derived from the Treaty to the conduct of space mining.

2.1 Boundary conditions

To begin with, the following paragraphs provide an overview of an initial set of boundary conditions that can be derived from Articles I – IV OST. This is because these articles are sufficiently prescriptive to derive operational and institutional limits shaping the conduct of space mining.

A. Under Article I (1) OST *the exploration and use of outer space shall be the province of all (hu)mankind*. The combination of this provision with the non-appropriation principle established under Article II OST (according to which *outer space including the Moon and other celestial bodies is not subject to national appropriation*) determines the legal status of outer space and celestial bodies as global commons.[16] The main implication of this status is that in order to preserve the freedom of exploration and use for all Countries, no State can exercise any form of exclusive control over them. Due to the invasive and consuming nature of space mining, its unconditional conduct would likely violate this rule and perhaps even raise to the point of constituting *de facto* territorial appropriation. Therefore, to preserve the legal status of celestial bodies as global commons, at the very least space resource activities have to be limited in scale and duration. For example, an actor planning to mine the entire Lunar south pole or conduct its space resource activities thereby for an unlimited amount of time would likely do so in violation of Articles I and II OST. Having said that, the concrete determination of these limits should be done in accordance with the principle of adaptive governance and taking into account the legitimate interest of operators to conduct their activities in a reasonably advantageous manner.
B. Pursuant to the first part of Article I (2) OST, *space shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law*. The principle of non-discrimination reinforces the status of space as global common

16 Frans von der Dunk, *International Space Law,* in Handbook Of Space Law 55-60 (Frans Von Der Dunk & Fabio Tronchetti eds., 2015).

and further characterizes it as a shared environment for international cooperation. Along the same line of reasoning stands the principle of equality, according to which all States are entitled to participate on an equal foot in the exploration and use of outer space. [17] In order to comply with these principles, actors conducting space resource activities should be open to the participation of all interested players on a non-discrimination basis, and actively engage in capacity building to foster equality in the use of celestial bodies.

C. Pursuant to the final part of Article I (2) OST, *there shall be free access to all areas of celestial bodies*. This principle acts as a key guarantee of the freedom to explore and use celestial bodies, insofar as it forbids States to seize exclusive control of their natural areas.[18] To comply with this principle, actors conducting space resource activities cannot impeded others from accessing their area of operations, which essentially means granting a right of free passage. At the same time, pursuant to Article IX OST, actors intending to exercise their right to transit through a mining site will have to undertake appropriate international consultations prior to the date of transit.

D. Pursuant to Article IV OST, *the Moon and other celestial bodies shall be used exclusively for peaceful purposes*. The principle of exclusively peaceful purposes is another key guarantee of the freedom to use celestial bodies thanks to the prohibition of all kinds of military activities on celestial bodies.[19] Since space resource activities make "use" of celestial bodies, they are fully subjected to Article IV (2). This sets two main boundary conditions. First, military entities do not have the right to autonomously engage in space resource activities. In accordance with the exceptions laid down in the provision, they might only provide "in kind" support, i.e. personnel, equipment and facilities, to space resource activities conducted by civilians. Second, space resources, including any space-made product derived therefrom, cannot be employed within military activities or for any military purposes (like weapons manufacturing). As a result, space resources and derived products can be *owned* by anyone so long as they are *used* exclusively for peaceful purposes.

17 Timiebi Agaba-Jeanty, *Realizing a Regional African Space Program,* in Innovation In Outer Space, *supra* note 13 at 258-259.

18 Stephan Hobe, *Article I of the Outer Space Treaty,* in Cologne Commentary On Space Law: Vol. 1 34 - 36 (Stephan Hobe, Bernhard Schmidt-Tedd & Kai-Uwe Schrogl eds., 2009 – book hereinafter referred to as "CoCoSL I").

19 Fabio Tronchetti, *Legal Aspects of the Military Uses of Space,* in Handbook Of Space Law, book cited *supra* at note 17, pp. 338-341.

2.2 Open questions

The boundary conditions posed by Articles VII, VIII, IX and XI are still too ambiguous to be crystallized at this stage. Since these provisions deal with procedural and interactional aspects, their analysis raises more questions than answers. The following paragraphs present the main open questions that need to be answered to enable the crystallization of the boundary conditions posed by these articles.

A. Concerning Article VII OST, the main question posed by this provision is how to apportion liability in case of damages caused during space mining accidents. As is well-known, each launching State is internationally liable for the damages caused by its space objects. However, the hostile location and ultra-hazardous nature of space mining would make it difficult to precisely identify the causal link behind any operational accident. Similar difficulties would arise for States Parties to the LIAB with respect to the determination of which of them would be at fault. In both instances, to operationalize either Article VII OST or the LIAB we need to develop specific norms of behaviours that can serve as reference standards for space mining operations.
B. Looking at Article VIII OST, the main question concerns how to ensure and allocate the exercise of jurisdiction and control over *space activities* and not just *space objects*. In its full scale, space mining will be a complex endeavour involving the interaction of different space objects performing different tasks such as extracting, storing, processing, and transporting throughout a relatively wide area. Since all these activities will have to be conducted in a coordinated way, having multiple States exercising limited jurisdiction and control over the individual objects involved does not seem like a very practical solution. Therefore, the main question is whether it is possible to extend jurisdiction and control over the entire activity, and, if yes, what would be the legal basis to do so.
C. Article IX OST is the most intricate provision of international space law. Due to its many layers, this article poses different kinds of question. The first and most important of them is how to comply with the principle of due regard. It seems that States will have to make sure that the space mining activities for which they are responsible do not spoil others from the possibility to undertake them too. However, it is unclear what this would require in practice. On the one hand, the time and size limitations suggested in the previous section could already be enough to pay due regard. On the other hand, the norm may be further extended to impose additional limitations on the types of resources that can be mined, for example. The second question raised by Article IX OST is how to address the harmful contamination of celestial bodies. Here again, at a very superficial level one could argue that States will have to minimize the

environmental impact of their space resource activities. However, it remains to be seen how far this principle could/should be extended. A traditional reading of Article IX OST would require States to prevent only those kinds of contamination that could *harmfully* impact the exploration and use of celestial bodies by other States. However, a more contemporary reading of this provision, especially considering new developments of environmental law, could go as far as preventing the causation of any sort of transboundary harm that may alter the natural balance of celestial bodies. Again, the definition of standards of behaviour could prove helpful in assessing compliance with environmental protection. The third and final question posed by Article IX OST concerns how to conduct *appropriate international consultations* in case of potentially harmful interference among activities. Section 11 of the Artemis Accords proposes to answer this question through the concept of *safety zones*. While the idea has merits, many States are worried about potential misuses of safety zones for the indirect establishment of *first-come-first-served* regime for the conduct of space mining.

D. Pursuant to Article XI OST, States *agree to share information about the nature, conduct, locations and results* of their space activities with the UN Secretary General, the public and the international scientific community. The main question posed by this provision comes from the low level of practice in sharing information about *activities*. Over the past fifty years, very few States used Article XI OST to share information about their space activities.[20] The result of this lack of practice is that not States not the UN are prepared to share information under this provision. In light of the key role that information sharing is set to play in building trust, enabling coordination and fostering cooperation, it is of the utmost importance to address this gap as soon as possible. A positive step in this direction is offered by the Article XI Template, a multilateral tool promoting enhanced practices for sharing information about activities in the exploration and use of outer space.[21]

Before concluding this section, it is important to note that the boundary conditions and open questions presented above lay untested in domestic legislation. In none of the four laws enacted by the US, Luxembourg, the UAE and Japan, one can find substantive provisions addressing any of the various key aspects discussed above. To be sure, this is not a critique to these laws. As seen before, under Article VI OST the purpose of national space legislation is to assure that space activities of private entities are conducted in

20 As reported online by UNOOSA (accessed September 2022).

21 More information on the Article XI Project can be found on its website (accessed September 2022).

conformity with the provisions of the Treaty. With regard to space mining, this requires that States first have agreed on what does it take to conduct space resource activities in conformity with the OST. Until these elements have been clarified multilaterally, domestic laws can hardly intervene.

At the same time, private companies are knocking at the door of their regulators demanding legal certainty and guidance. Thankfully, the small scale of the space resource activities planned now means that they can be licensed without having to make major normative choices on the interpretation of the OST. However, hot topics like safety zones have the potential to still divide the community and generate tensions regardless from the small size of operations, due to both their symbolic and legal implications as normative precedents. As it will be discussed in the third section, in the opinion of this author the present *impasse* and its associated risks require the development of correctives for enhanced coordination and institutional consultation.

The above paragraphs provide a snapshot of a much broader and deeper analysis on the applicability of international space law to the conduct and regulation of space mining. Within the context of this paper, the findings presented in this section served the purpose of characterizing the regulatory *impasse* faced by the system of space mining and provide the reader with a solid basis to understand the following analysis on enforcement.

3. The Enforceability of Space Mining Regulations

The lack of regulatory clarity showed in the previous section has major implications on the enforceability of existing international and national norms of space mining. In law, the concept of "enforcement" refers to the process envisaged by a given regulatory system to restore compliance with its rules, pursuant to the formal establishment of a violation through adjudicatory processes. Thus, it is legally not possible to enforce a provision until the entity empowered to authoritatively pronounce on its meaning has done so. In the case of space mining, the body in charge of the development of international space law – UNCOPUOS – has not done so (yet). However, two entities empowered to pronounce on the implications of the OST on the conduct of space mining would be the International Court of Justice (ICJ) and the Permanent Court of Arbitration (PCA). The ICJ could do so in virtue of its status as the principal judicial organ of the United Nations, whereas the PCA could intervene thanks to its reputation as a recognized international tribunal and its adoption of a dedicated set of rules for space disputes. Given the secondary role of national legislation under Article VI OST, domestic entities would not be legitimized to pronounce on these questions of international law. The next paragraphs thus discuss what mechanisms would be available to enforce an ICJ judgment or a PCA award.

To begin with ICJ judgments, pursuant to Article 94 (1) UN Charter the decisions of the ICJ are binding upon UN Member States for all cases to which they are Parties.[22] Under the second paragraph of this article, enforcement of ICJ judgments is entrusted to the UN Security Council (UNSC) through the powers attributed to it under the Charter.[23] Unfortunately, Article 94 (2) UN Charter subjects the exercise of this task to a double layer of discretion that jeopardizes its practical relevance. First, the UNSC cannot autonomously intervene to enforce an ICJ judgment unless requested by the relevant creditor State or otherwise justified on other legal grounds under the Charter. Second, even if a creditor State would seek the intervention of the UNSC, the latter is not obliged to take any action. As a result of these constraints, Article 94 (2) UN Charter is basically *tamquam non esset* (i.e. as non-existent). Not by chance, over the past 60 years this provision has been invoked only in five occasions and has never been used to justify any enforcement action.[24] Since this is the only mechanism legally foreseen by the Charter for enforcing ICJ judgments, in practice they are unenforceable.

For what concerns PCA awards, under Article 18 of the Arbitration Convention States Parties to the PCA agree *to submit loyally to its awards*,[25] which thus are binding upon the Parties. As a result, PCA awards are enforceable under the New York Convention (NYC), an international agreement concluded in 1958 to maximize the international circulation of arbitral awards by removing obstacles to their recognition and enforcement.[26] The NYC has been ratified by 157 States and is one of the most successful treaties in the world.[27] Due to its legal status as an international agreement, enforcement under the NYC meets high standards of legitimacy. Thanks to the *pro enforcement bias* characterizing the Convention[28] and its reliance on domestic courts, enforcement of arbitral awards under the NYC has proved to be extremely effective. As a result, the enforcement of PCA awards through the NYC is the only feasible option currently available for space

22 Charter of the United Nations, *entered into force* Oct. 24, 1945, 1 UNTS 16.

23 Article 94 (2) UN Charter, *supra* note 23.

24 For an excellent analysis of existing practice under Article 94 (2) UN Charter *see* Edgardo Sobenes Obregon, *Recourse to the Security Council under Article 94 (2) of the United Nations Charter,* in Max Planck Encyclopedia Of International Procedural Law 14 -16 (2017).

25 Convention for the Pacific Settlement of International Disputes *entered into force* Sept. 4 1900, 32 Stat. 1799 (1900).

26 Convention on the Recognition and Enforcement of Foreign Arbitral Awards, *entered into force* Jun. 7, 1959, 330 UNTS 3.

27 Message from the Secretary of United Nations Commission on International Trade Law (UNCITRAL), available online (accessed September 2022).

28 Emmanuel Gaillard and Benjamin Siino, *Enforcement under the New York Convention,* in The Guide To Challenging And Enforcing Arbitration Awards 88 (J William Rowley, Emmanuel Gaillard and Gordon E Kaiser eds., 2019).

mining regulations. There is however one important downside that needs to be considered. Because of the need to first obtain the consent of all parties to submit to the arbitration process, then go through the procedure to obtain an award, and finally have recourse to a domestic court for its recognition and enforcement under the NYC, the timing of this mechanism is not particularly effective. In complex cases, it may take several years before any enforcement would be realized. Since enforcement of arbitral awards under the NYC is the only option available to enforce international norms of space mining, this timing issue leaves the system exposed to serious risks of tensions and conflicts. To mitigate such risks, the next section proposes pragmatic correctives that can help stabilizing the system until the UNSRWG fulfills its mandate or potential arbitral disputes get adjudicated by the PCA and enforced under the NYC.

4. Two Correctives for the Way Forward

In the quest for correctives that can help stabilize the system of space mining, useful inspiration can be taken by looking at how comparable regimes governing other global commons have addressed similar issues. To this end, this author carefully studied the International Telecommunication Union (ITU)[29] and the Antarctic Treaty (AT)[30] to find mechanisms that can be used to reduce the need for *ex post* enforcement. Taking inspiration from these models, the following paragraphs propose correctives that can stabilize the system via enhanced coordination and institutional consultation.

1st corrective: enhanced coordination

In light of the upcoming beginning of space resource activities on the Moon, the most useful corrective that can be introduced at this stage deals with enhanced practices for international coordination of space mining. Taking inspiration from the procedures employed in the ITU Radio Regulations to combine effective uses of spectrum and orbits with their equitable uses,[31] the first corrective proposed combines due regard and international consultation under Article IX OST with information sharing under Article XI OST for the fair coordination of space resource activities. Through this corrective it is possible to answer one of the key questions discussed in the previous section, i.e. how far a State should go in assessing the risk of causing potentially harmful interference. On its own, Article IX OST provides a quite tricky

29 Constitution and Convention of the International Telecommunication Union *entered into force July 1st 1994,* 1825 UNTS 1.

30 The Antarctic Treaty, *entered into force* June 23, 1961, 402 U.N.T.S. 71.

31 Mahulena Hofmann & Tanja Masson-Zwaan, Introduction To Space Law 105 (2019).

parameter: the existence of *reasons to believe* that a potentially harmful interference may occur. As is well known, the main issue with this parameter is that it is difficult to apply it in an objective manner. Through the proposed corrective, this issue is resolved through introducing Article XI OST in the equation. By sharing information on its planned or ongoing space resource activities, a State would put the others *on notice* about them. Under the principle of due regard, everyone will have to take them into account when planning or conducting their own activities. What is more, a State sharing information under Article XI OST would provide other States planning to conduct activities in the same area at the same time with objective *reasons to believe* that they would cause potentially harmful interference. In turn, this would trigger the duty to undertake appropriate international consultations that can then be used to coordinate operations.

2nd corrective: institutional consultation

Enhanced coordination practices are a key step towards the stabilization of the system, but on their own they might not be enough. To prevent potential abuses and build trust, the second corrective suggests to leverage the institutionalized opportunity offered by the meetings of the UNSRWG for regular consultation and review of space mining regulations and operations. This is because, as discussed, space mining operations will begin years before the planned released of the set of initial recommended principles by the UNSRWG. Pursuant to Article VI OST, national regulators will have to make very delicate choices about how to ensure the conduct of these activities in conformity with the OST. Since such decisions will be based on different interpretations of the Treaty, there is a serious risk for regulatory divergence. If unmanaged, this divergence may cause misunderstandings, which in turn could create tensions and, ultimately, conflicts. Learning from the successful model of the Antarctic Treaty Consultative Meetings (ATCM),[32] the corrective suggests using the UNSRWG as a neutral platform to dialogue about domestic regimes for the authorization and supervision of private space resource activities, in order to keep the divergence within acceptable margins.

5. Conclusion

The combination of the findings presented throughout the various sections of this paper leads to the following conclusions.[33] First, the key boundary

32 Thomas Lord, *The Antarctic Treaty System And The Peaceful Governance Of Antarctica: The Role Of The ATS In Promoting Peace At The Margins Of The World*, 10 (1) Polar Journal 7 - 12 (2020).

33 For a more in-depth analysis of the issues discussed in this paper, *see* Antonino Salmeri, The Multi-Level Governance Of Space Mining (2023).

conditions shaping the conduct of space resource activities will have to be agreed at the multilateral level. While the UNSRWG progresses on this, the system needs to be stabilized through enhanced coordination and consultation mechanisms designed to avoid interference and misunderstandings. These mechanisms could be developed in a short timeframe taking inspiration from comparable solutions employed in the ITU and ATS models and would be based upon Articles IX and XI OST. In parallel, States should commit to the peaceful resolution of potential legal disputes related to space mining through international arbitration before the PCA.

Despite all good intentions, an international incident might be just around the corner. At the end of August 2022, the US National Aeronautical and Space Administration (NASA) revealed 13 potential landing sites for the Artemis program.[34] Unsurprisingly, it turned out that some of them overlap with those announced a few weeks before by the Chinese National Space Administration for its International Lunar Research Station.[35] Under the current regulatory uncertainty, and due to the lack of agreed mechanisms for international coordination, consultation and dispute resolution, the only available means to address these overlaps are bilateral negotiations. Failing those, States may decide to resort to unilateral measures, which in turn would start a series of harsh reactions with the potential to seriously threaten the peaceful uses of outer space.

Thankfully, there are more reasons to be optimistic than pessimistic about the future. The SRWG seems to be well equipped to fulfil its mandate, thanks to the thought leadership demonstrated by its Chair and Vice-Chair and the constructive approach adopted by States. And non-governmental stakeholders are playing a very useful part by feeding the debate with their expert contributions.

34 As reported online by NASA (accessed September 2022).

35 Andrew Jones, *NASA and China are eyeing the same landing sites near the Lunar South pole*, available online (accessed September 2022).