

Governance of Space Resources: Efforts to Achieve an International Regime for Sustainable Space Resource Activities

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Abstract

The working paper addresses global governance of space resources and its actions to fill regulatory gaps. It analyzes if the current governance scenario is designing a new international regime, which would go beyond a strictly legal regime, with specific principles, norms, rules and decision-making procedures to promote coordination and cooperation between all actors interested in the exploitation of space resources, and more adequately deal with present and future challenges. For this purpose, the research approaches space law and policy matters from the Theory of International Regimes' perspective, accessing international, governmental and multi-stakeholder initiatives. The paper identifies that there is a general recognition of principles of space law and other congruences that could potentially lead to an international regime to govern space resources exploitation. Such a regime could establish permanent institutions based on converging expectations and contribute to the long-term sustainability of those activities.

Keywords: Space Resources; Global Governance; International Regimes; Space Law; Space Sustainability.

1. Introduction

Throughout human history, the use and exploration of outer space have inspired society and as the new millennium gets further underway, the impact of space activities upon the welfare of humanity only increases. As some of the dreams of the Apollo era are becoming feasible, permanent human

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presence on the Moon is not only a magnificent goal on its own but may also be deemed as the first step to reach for the stars.

The new space era calls for international cooperation and a focus on our planet. New space evolves in an environment where governments and private interests cohabitate, and possibilities multiply as technological capabilities advance. In this complex scenario, traditional mechanisms of ruling behaviors, based exclusively on States' authority and sovereignty, increasingly face challenges in dealing with current and future global problems on their own, while global governance perspectives arise as more adequate alternatives.

This paper addresses global governance perspectives regarding exploitation of mineral resources on celestial bodies. Space resources utilization *in situ* is expected to enable permanent human presence on the Moon and deep space human exploration. Through the review of global governance efforts, this research aims at verifying if it is likely that participants in space resource activities and other interested actors are building an international regime to govern the use of space resources.

In this effort, the authors study space resources regulation through the lenses of the Theory of International Regimes, arguably under an innovative approach, which has even been the subject of publication in a Brazilian scientific journal.¹ The theory, widely applied in International Environmental Law, offers key elements to understand mechanisms adopted by the international community to successfully confront complex global issues.

The research methodology applied is bibliographic, through qualitative analysis, and follows the inductive method. In short, the authors offer herein an academic contribution towards global space governance, recognizing the positive impact that space activities have on society.

2. Global Governance and the Theory of International Regimes

Relations beyond territorial borders tend to be complex, especially when they comprehend a plurality of actors, goals, behaviors and are associated to technological development. Complexity encompasses an elevated number of possibilities within a system:² complex social relations offer a wide variety of choices of action, and to every action, many possible and diverse reactions are made available.

In our global society possibilities grow exponentially; thus, many variables influence individual and social choices, making it necessary to aggregate

1 S.C. Malhadas, F.C.F. Rei, A Exploração Econômica dos Recursos Minerais Espaciais: um Regime Internacional em Formação?, *Direito.UnB – Revista de Direito da Universidade de Brasília* 4-3 (2020) 162–181.

2 N. Luhmann, C.F. Campilongo, *A Diferenciação do Direito: Contribuições à Sociologia e à Teoria do Direito*, Sociedade Editora Il Mulino, Bologna, 1990, p. 2.

different individual actors' preferences into a group choice.³ Complex environments often require advanced collective decision-making mechanisms to allow the identification of converging expectations and balance diverging interests to increase problem-solving capabilities.⁴ Society's involvement in identifying shared issues and nurturing strategies to cope with them have the potential to offer a more comprehensive approach towards complex affairs.⁵ In such a context, the inability of States to equate intricate global socio-environmental affairs left space for a new model of regulation, guided by the "redistribution" of State power.⁶ New actors emerged and gained prominence, with their specific influence, leading to the outbreak of a global, multidimensional society, and, consequently, of a new decision-making system in the international arena.⁷

Global governance arises as a global society's new paradigm.⁸ It is the total sum of all the ways through which members of this society manage their shared problems.⁹ It is simultaneously a means to promote cooperation between social actors and a process capable of producing effective results in the management of global problems.¹⁰

Within governance processes, States are no longer the only sphere of authority, co-existing with other relevant social actors, such as International Organizations, intergovernmental arrangements, civil associations, corporations, scientists, academia and individuals.¹¹ All are relatively independent when coping with their pertinent issues, but there is some degree of interdependence,¹² considering that the collectivity may be affected by the outcomes of each actor's actions.

3 O.R. Young, *International Cooperation: Building Regimes for Natural Resources and the Environment*. Cornell University Press, New York, 1989, p. 18.

4 M.A. Levy, O.R. Young, M. Zürn, *The Study of International Regimes*. *European Journal of International Relations* 1 (1995) 278.

5 A. Gonçalves, *Governança Global*, in: A. Gonçalves, J.A.F. Costa (Eds.), *Governança Global e Regimes Internacionais*, Almedina, São Paulo, 2011a, pp. 85-90.

6 L.C.C. Lima, F.C.F. Rei, *O Papel da Soft Law Privada no Enfrentamento da Problemática Socioambiental Global*. *Revista Eletrônica Direito e Política*, 13, 2 (2018).

7 *Ibid.*

8 A. Gonçalves, *Regimes Internacionais como Ações da Governança Global*, *Meridiano* 47 12-125 (2011b), p. 41.

9 *Id.* at 43.

10 Gonçalves, *supra* note 5 at 53.

11 *Id.* at 37.

12 K. van Kersbergen, F. van Waarden, 'Governance' as a Bridge Between Disciplines: Cross-disciplinary Inspiration Regarding Shifts in Governance and Problems of Governability, Accountability and Legitimacy, *European Journal of Political Research* 43 (2004), p. 151-152.

Coercion and power – inherently sovereign governments’ mechanisms – are substituted by persuasion and consensus tools.¹³ Such tools do not deny national government’s authority and sovereignty but evidence they are not the only relevant factors shaping social relations, nor the most effective towards most complex themes.¹⁴

Consequently, non-hierarchical networks are created through global governance. They are built upon negotiation processes, accommodation of interests, arrangements and alliances between all actors concerned.¹⁵ Bargaining processes aim at influencing behaviors and facilitating international cooperation,¹⁶ to attain more effective results to all participants. The need of advancing agendas in complex arenas, which presuppose concerted efforts towards international cooperation, has led to an increasing recourse to non-legally binding instruments, commonly referred to as soft law. In opposition to hard law instruments, which encompass international treaties, conventions, protocols and legal agreements between States, creating legal obligations and rights to the negotiating parties, soft law instruments are based on political and moral mechanisms to persuade all the interested actors in a particular issue to cooperate and compromise towards common goals.¹⁷

Although not legally binding, soft law benefits from a broader participation of society, to raise awareness, mobilize to action, create compromise and guide behaviors. Those purposes are pursued, for instance, through guidelines and private standards. Soft law instruments have the inclusiveness and the flexibility to promptly adjust to constantly changing circumstances.¹⁸ Therefore, they contribute to State’s and society’s adaptation in the face of global matters.

Inasmuch as non-hierarchical relations tend to present specific risks in each particular social sphere, cooperational institutions and actions vary from one domain to another, to better cope with specificities.¹⁹ In these conditions, when dealing with particular areas of concern, they may evolve into more sophisticated forms of coordination and give rise to international regimes.

International regimes are actions of global governance²⁰ that form institutional arrangements of a permanent nature. Those arrangements

13 Gonçalves, *supra* note 5 at 39-40.

14 *Id.* at 40.

15 van Kersbergen & van Waarden, *supra* note 12 at 152.

16 Gonçalves, *supra* note 5 at 49.

17 U. Beyerlin, T. Marauhn, *International Environmental Law*, Hart Publishing Ltd., Oxford, 2011, p. 290.

18 F. Lyall, P.B. Larsen. *Space Law: a Treatise*, Ashgate, England – US, 2009, p. 51.

19 van Kersbergen & van Waarden, *supra* note 12 at 152.

20 Gonçalves, *supra* note 8 at 44.

govern participants' actions within specific activities or set of activities,²¹ to promote understanding and cooperation.²² Accordingly, they can affect behaviors of States and all other relevant actors²³ towards the implementation of their common goals.²⁴

An international regime is created through negotiation with broad participation of relevant stakeholders in a specific area, who wish to improve ongoing conditions and avoid foreseeable negative externalities which may prove to be costly. Participants organize their own interactions to achieve collective strategies and enable better results for all of them while fulfilling their ambitions,²⁵ as for example, in the Ozone Layer Regime, the Non-Proliferation of Nuclear Weapons regime, Sea-fishing regimes and numerous others. Bargaining processes, in which players are engaged through global governance mechanisms, enable the identification of common challenges and converging expectations, alignment of strategies and development of institutions to form and operationalize a particular regime.

Institutions of international regimes are sets of principles, norms, rules and decision-making procedures²⁶ to guide interactions.²⁷ According to the objectives and circumstances in which a regime comes into existence, different levels of formality are required. Thus, institutions may or may not be based upon international conventions.²⁸ Participants' objectives and the nature of the problems they are dealing with also define the characteristics of institutions that each regime will adopt for structuring behaviors, their mechanisms of collective choice and enforcement.²⁹

States are still prominent sources of authority and significant players within international regime structures. Yet, sub-national governments and private actors are crucial for identifying concerns, framing themes to the active international agenda, formulating strategies and inducing States to build institutions to govern and stabilize their interactions.³⁰

21 Young, *supra* note 3 at 12.

22 Gonçalves, *supra* note 8 at 42.

23 S. Haggard, B.A. Simmons, *Theories of International Regimes*, J. International Organization 41-3 (1987) 513.

24 Young, *supra* note 3 at 14.

25 P.S. Chasek, D.L. Downie, J.W. Brown, *Global Environmental Politics: Dilemmas in World Politics*, seventh ed., Routledge, New York, 7. ed, 2018, p. 22.

26 S.D. Krasner, *Causas Estruturais e Consequências dos Regimes Internacionais: Regimes Como Variáveis Intervenientes*, *Revista de Sociologia e Política* 20-42 (2012) 94.

27 Levy *et al.*, *supra* note 4 at 274.

28 *Ibid.*

29 Young, *supra* note 3 at 15-21.

30 Levy *et al.*, *supra* note 4 at 280.

The concept of international regime is distinct from international legal regime. While legal regimes are exclusively based upon legally binding instruments emanated from States' authority, individually or through intergovernmental entities, international regimes are more comprehensive. They provide broad social participation throughout their formation, operation and extinction, and their instruments are not exclusively legal, incorporating political and technical instruments through interdisciplinary perspectives.

Although it may be argued that governance in outer space has remained on the margins of the main political global fora for international cooperation and major regional organizations,³¹ it is increasingly gaining relevance in the international arena.³² The following sections will evidence that gaps in space law have turned the theme of space resource activities into an important topic in the global agenda.

3. International and Domestic Space Law

Traditionally, outer space matters have been addressed multilaterally, at the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). The Outer Space Treaty (OST), ratified by 111 States,³³ is the Magna Carta of Space Law and basis to the four subsequent treaties adopted within the COPUOS framework: the Rescue Agreement, the Liability Convention, the Registration Convention and the Moon Agreement (MA). Those treaties elaborate norms in accordance with OST's provisions and, along with it, form the hard law structure governing outer space.

Space resource activities are ruled by the OST and the MA. The OST establishes freedom of access and use of outer space for peaceful purposes, but also prohibits national appropriation by any means. Considering that the exploitation of space resources is not expressly authorized nor prohibited by the international legal framework, consensus has not yet been achieved in the international community whether space resource activities would represent a breach of Article II OST, even though several scholars advocate it does not

31 P. Martinez, P. Jankowitsch, K. Schrogl, S. di Pippo, Y. Okumura, Reflections on the 50th Anniversary of the Outer Space Treaty, UNISPACE+50, and Prospects for the Future of Global Space Governance, *Space Policy* 47 (2019) 31.

32 Space's increasing importance in political global fora is exemplified by the meeting held in September 2021, between G20 space economy leaders, with the theme: "Space for People, Planet and Prosperity".

33 UNOOSA, Status of International Agreements relating to Activities in Outer Space, <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/status/index.html> (accessed 18.09.2021).

constitute a means of sovereign appropriation of outer space.³⁴ Global governance initiatives analyzed in section 3 present similar interpretations.

OST also prescribes that the use and exploration of outer space shall be the province of humankind and shall be carried out for the benefit and in the interest of all countries. Additionally, the MA stated that the Moon is the common heritage of humankind, and an international regime shall be established to govern the exploitation of its resources. Such a regime shall set up rational management of natural resources, expansion of opportunities in their use and equitable sharing of benefits, balancing interests and needs of developing countries with efforts of the countries that contributed directly or indirectly to the exploration of the Moon.

However, the lack of consensus around the extension of the common heritage of humankind concept and the features that should define such regime resulted in few ratifications of the MA.³⁵ Irrespective of its legally binding nature amongst States parties, Article 11 MA is not regarded as customary international law, due to the absence of consistent State practice and *opinio juris*.³⁶ Accordingly, it is not binding upon non-signatory States, and U.S. denied its application when regulating space resource activities.³⁷

Considering that the law of outer space was shaped when commercial exploitation was not an actual matter, the existence of legal gaps is not unexpected. Still, regulatory gaps over key issues entail uncertainties for commercial enterprises,³⁸ which affect the operationalization of public and private activities.³⁹ Since the conclusion of hard law instruments is unlikely to happen at present geopolitical circumstances,⁴⁰ the way forward for governing space resource activities may be through conjugating interpretation

34 See S. Hobe, *Outer Space as the Province of Mankind – An Assessment of 40 Years of Development*, IAC-07-E6.5.04, Proceedings of the 50th Colloquium on the Law of Outer Space, Hyderabad, India, 2007; R. Jakhu, S. Freeland, Article II, in: S. Hobe, B. Schmidt-Tedd, K. Schrogl (Eds.), *Cologne Commentary on Space Law: Outer Space Treaty*, BWV, Berlin, 2017, pp. 258-259; I. Christensen, C.D. Johnson, *Putting the White House Executive Order on Space Resources in an International Context*, *The Space Review*, 2020, <https://www.thespacereview.com/article/3932/1> (accessed 28.04.2020); R.J. Lee, *Law and Regulation of Commercial Mining of Minerals in Outer Space*, Springer, 2012, p. 163-164.

35 18 ratifying States up to January 2021: UNOOSA, *supra* note 33.

36 S.S. “*Lotus*,” (France v Turkey), Judgement, 1927, 10 P.C.I.J. (Ser. A) (Sep. 7), p. 28.

37 U.S., Executive Order 13.914, on Encouraging International Support for the Recovery and Use of Space Resources, April 6, 2020.

38 Lee, *supra* note 34 at 2.

39 Martinez *et al.*, *supra* note 31 at 30.

40 F. von der Dunk, F. Tronchetti, *Handbook of Space Law*, Edward Elgar Publishing, Cheltenham-Northampton, 2015, p. 41; See also Lyall & Larsen, *supra* note 18 at 562-563.

mechanisms with bottom-up and top-down approaches,⁴¹ like national legislation, bilateral or multilateral agreements, guidelines, building blocks and private standards.

In this context, the U.S., Luxembourg, the United Arab Emirates (U.A.E.) and Japan adopted space resources regulations in 2015, 2017, 2019 and 2021, respectively. Those instruments authorize the exploitation, possession and commercialization of space resources by their nationals, whose activities may be carried on upon governmental approval and in accordance with international obligations.

National regulatory initiatives are propelled by concerns regarding general issues, such as liability, and by governments' interest in encouraging commercial entities under their jurisdiction.⁴² National law instruments seek domestic legal certainty to create an enabling environment for space resource activities, by clarifying rights and duties and establishing rules of conduct.

Nonetheless, legal certainty cannot be achieved unilaterally in the global arena.⁴³ National regulation concerning global themes must be enacted in accordance with space law and require some level of mutual recognition.⁴⁴ Still, one should acknowledge that the pioneering of domestic regulation allows the recognition of space resource activities' baselines for more comprehensive initiatives. The U.S. Executive Order n. 13.914 exemplifies an attempt to establish joint initiatives between like-minded States, to develop broader regulatory structures built upon the OST.⁴⁵

Notwithstanding possible gains, unilateral initiatives carry the risk of creating incompatible norms, disregard for international space law, flags of convenience and race to the bottom processes, which jeopardize legal certainty on space resource activities and may escalate conflicts.⁴⁶ To avoid those threats, global governance is a significant tool for coordinating regulatory actions and promoting compliance with international obligations, avoiding diverging interpretations, disregard for non-space faring nations' interests and other hazards to long-term sustainability of outer space.

41 Christensen & Johnson, *supra* note 34.

42 R.S. Jakhu, J.N. Pelton, *Global Space Governance: An International Study*, Springer, Cham, 2017, p. 50.

43 Christensen & Johnson, *supra* note 34.

44 *Ibid.*

45 U.S., Executive Order n. 13.914, on Encouraging International Support for the Recovery and Use of Space Resources, April 6, 2020.

46 C.S. Santos, M.S.R. Huidobro, S.C. Malhadas, A Regulação da Exploração Econômica do Espaço e o Grupo Internacional de Trabalho de Haia para a Governança de Recursos Espaciais, in: D.F. Almeida, F.L. Menezes, O.O. Bittencourt Neto (Eds.), *As Organizações Internacionais e os Tribunais no Contexto do Direito Internacional*, Lawinter Editions, New York, 2020, p. 45-78.

4. Governance Initiatives

In the field of space resources, in 2015, the International Institute of Space Law issued a “Position Paper on Space Resource Mining”, analyzing the U.S. Commercial Space Launch Competitiveness Act. The paper asserted the legality of space resources appropriation under the OST, provided other international obligations are properly observed. It also noted the convenience of developing international rules to coordinate activities for the benefit and in the interests of all countries.⁴⁷

Space resource activities became a specific agenda item at the COPUOS Legal Subcommittee (LSC) in 2016.⁴⁸ Moreover, COPUOS actions on other matters frequently deal with the theme, for instance, the 2019 LTS Guidelines adopted the notion of intergenerational sustainability in outer space.⁴⁹

In June 2021, the LSC established a working group on space resources, which resulted from concerted efforts from Austria, Belgium, Czechia, Finland, Germany, Greece, Poland, Portugal, Romania, Slovakia and Spain, as well as proposals by China, Russia and statements of several delegations and observers, from which convergences emerged as starting points for the debate around the creation of a regulatory framework for space resource activities.⁵⁰

An enabling element for this achievement was the fact that, over the past years, exploitation of resources in outer space has gained centrality in multi-stakeholder debate fora, such as the Hague International Space Resources Governance Working Group (The Hague Working Group), the Moon Village Association (MVA) and the Space Generation Advisory Council (SGAC).

The Hague Working Group, a multi-stakeholder consortium established in 2016, delivered a set of Building Blocks to lay the groundwork for the development of a regulatory and governance framework for space resource activities, in accordance with the law of outer space.⁵¹ They provide definitions for key terms, elaborate principles and declare the right of appropriation over natural resources in outer space. They also propose innovative mechanisms, such as temporary safety zones over specific areas, coordination channels, priority rights, benefit sharing instruments, and

47 International Institute of Space Law, Position Paper on Space Resource Mining, 2015.

48 Christensen & Johnson, *supra* note 34.

49 COPUOS, A/74/20, Report of the Committee on the Peaceful Uses of Outer Space, 2019.

50 COPUOS A/AC.105/1243, Report on the Legal Subcommittee on its Sixtieth Session, 2021.

51 O.O. Bittencourt Neto, M. Hofmann, T. Massonzwaan, D. Stefoudi (Eds.), Building Blocks for the Development of an International Framework for the Governance of Space Resource Activities: A Commentary, Eleven International Publishing, The Hague, 2020, p. 1-2.

promote alternative dispute resolution mechanisms, especially the Permanent Court of Arbitration (PCA) Optional Rules for Arbitration of Disputes Relating to Outer Space Activities. The Building Blocks are consistent with the principle of adaptive governance⁵² and were presented in the 60th Session of the LSC, in 2021.

The MVA is a permanent multi-stakeholder cooperation forum for the sustainable development of human activities on the Moon, representing society and the international space community in the decision-making processes relating to the Moon.⁵³ In 2020, the MVA issued the Best Practices for Sustainable Lunar Activities, defining a common level playing field for sustainable lunar activities in consonance with the law of outer space. Section 8 establishes that appropriation of space resources does not constitute national appropriation of celestial bodies and, therefore, is legal. The development of instruments to govern the exploitation of resources is encouraged and shall encompass mechanisms of transparency, non-interference, priority rights, and processes to limit activities as to location and duration, to ensure equitable and responsible uses. The document also addresses registration of lunar activities, benefit sharing, alternative mechanisms of dispute resolution and adaptive governance.⁵⁴

MVA is also hosting the Global Expert Group on Sustainable Lunar Activities (GEGSLA), a platform created in 2021 for multi-stakeholder discussions on lunar exploration. The deliverables will be a Recommended Framework and Key Elements for Peaceful and Sustainable Lunar Activities, as well as Guidelines for lunar activity implementation and operations, dealing with benefits for humanity, information, registration, access to natural resources and so on.⁵⁵

Another initiative that stands out is the SGAC Effective and Adaptive Governance for a Lunar Ecosystem (EAGLE) Report. SGAC is a non-governmental organization that represents students and young space professionals to the international community.⁵⁶

The EAGLE Report was submitted to the COPUOS Legal Subcommittee in 2021, to provide inputs for a lunar governance regime and a proposal for a

52 *Id.*

53 Moon Village Association, About, <https://moonvillageassociation.org/about/> (accessed 19.09.2021).

54 Moon Village Association, Best Practices for Sustainable Lunar Activities, 21 October 2020, <https://moonvillageassociation.org/download/best-practices-for-sustainable-lunar-activities-issue-1/> (accessed 19.09.2021).

55 COPUOS, A/AC.105/2021/CRP.13: Report of the Moon Village Association on the Global Expert Group on Sustainable Lunar Activities, 2021.

56 COPUOS, A/AC.105/C.2/2021/CRP.13: Effective and Adaptive Governance for a Lunar Ecosystem Lunar Governance, 2021.

Lunar Governance Charter. It recognizes the legality of exploitation activities, which shall be developed in accordance with the OST and promote inclusiveness through capacity building and benefit sharing, interoperability, international standards, protection of human life and preservation of heritage sites. It also encourages safety zones, registration of activities and dispute resolution through amicable mechanisms, such as the PCA and the Dubai Space Court.⁵⁷

Finally, the Artemis Accords have also incited the development of space resource activities. Part of the U.S. Artemis program, they are a set of commitments between U.S. and like-minded States, agreeing on fundamental principles to guide cooperation for civil exploration and exploitation activities⁵⁸ With 13 signatory States so far,⁵⁹ including Australia, which is also a party to the MA, the accords establish the legality of commercial exploitation activities, that shall be guided by peaceful purposes, transparency, interoperability, preservation of heritage sites, due regard, deconfliction through safety zones, mitigation of debris, among others.⁶⁰ Although non-legally binding, Artemis Accords provide a solid point of departure for an international framework on exploitation activities, based on the implementation of the OST and LTS Guidelines and employing adaptive governance strategies.⁶¹

Significant convergences emerge from the multiple governance initiatives, revealing promising perspectives for the construction of a comprehensive framework for space resource activities.

5. Results and Discussion

Reasonably aligned governance actions may contribute to the mutual recognition of rights and obligations between stakeholders in a specific set of activities, to promote peaceful and orderly advances. Institutional arrangements for space resources activities are being developed in manners which can potentially lead to the creation of an international regime.

It would be inaccurate to affirm the existence of an international regime of outer space since the concept of international regime necessarily applies to a specific activity or set of closely related activities. Outer space is an arena

⁵⁷ *Ibid.*

⁵⁸ C. Johnson, *The Space Law Context of the Artemis Accords*, 2020.

⁵⁹ NASA, *The Artemis Accords*, <https://www.nasa.gov/specials/artemis-accords/index.html> (accessed 10.01.2022).

⁶⁰ NASA, *The Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets and Asteroids for Peaceful Purposes*, 2020.

⁶¹ R. Deplano, *The Artemis Accords: Evolution or Revolution in International Space Law?*, *International and Comparative Law Quarterly*, 70-3 (2021) 799-819.

where numerous activities coexist. Although interconnected to some degree, they demand particular rules and mechanisms to deal with their distinct challenges.

Exploitation of space resources is one of those areas which can be governed via a specific international regime. Nonetheless, the analysis must avoid “the temptation to assume the presence of some regime in every specifiable activity”.⁶²

Building a regime usually takes at least three stages: agenda formation, institutional choice, and operationalization.⁶³ It has been demonstrated that space resource activities gained prominence as a theme of global concern. There is a growing demand for broad, collective and cooperative frameworks, which shall embody principles of space law, expand the interpretation of existing norms, establish concepts, rights and obligations, create registration and monitoring authorities, in addition to dispute resolution mechanisms.

As governance initiatives evolve, they are converging around some fundamental principles that should guide exploitation of space resources – essentially, those of the OST. There is also a high degree of convergence around the outlines for norms, rules and decision-making procedures to be adopted, which shall provide transparency of basic relevant information to avoid harmful interference, registration of activities, interoperability, safety zones, protection of people and cultural heritage, capacity building etc.

There are no fundamental divergences between proposed governance frameworks, and the broad participation of social actors on their formation and operationalization stands out as one of the major convergences, alongside with a common understanding that flexibility and adaptability are key elements for a successful regime. In this sense, it is expected that instruments of hard law, like the OST and the MA, and soft law, such as the LTS Guidelines, technical standards and other instruments, eventually harmonize to create an international governance framework.

This set of principles, norms, rules and the possibility to share management and collective choice mechanisms – like COPUOS and the PCA – with other regimes, should enable institutionalized intersections with them. Many international regimes are operationalized without instituting an International Organization for that specific purpose. Regimes may use existing organizations and structures associated with other regimes or with a more comprehensive international order to save participant’s resources and benefit from existing know-how.⁶⁴

⁶² Young, *supra* note 3 at 22.

⁶³ Levy *et al.*, *supra* note 4 at 282.

⁶⁴ Young, *supra* note 3 at 25-27.

Those intersections frequently contribute to the evolution of regimes. Interlinkages of institutions, participants or structures between different regimes tend to improve resilience and refine actors' perceptions of each other's behavior, enhancing compliance.⁶⁵ Moreover, regimes' intersections provide inputs for the improvement of internal systems of adaptation, response, and externality control.

An international regime governing particular resources facilitates the development and exchange of information between the participants and, as long as clear benefits arise from being part of that regime, the costs of not complying with it tend to inhibit incompatible behaviors.⁶⁶ Those aspects can be significant additions to a successful management of natural resources in outer space.

6. Conclusions

The Theory of International Regimes provides a well disseminated approach towards complex global issues in the field of International Environmental Law. This research offers an innovative perspective by adopting such theory as a frame of reference towards outer space affairs.

Clearly, coordination is required for space resource activities to be conducted in a peaceful, sustainable manner and for the benefit of all humankind. Yet, coordination of space resources governance can be shaped in many ways.

Building an international regime for space resources is one of the current possibilities. Numerous intersection points between governance initiatives have been demonstrated. The research also evidenced that such actions are promoting the identification of a set of principles and converging fundamental contours for the establishment of norms, rules and decision-making procedures for collective choices, which may be leading to the formation of an international regime.

Sustainability of space resource activities depends on the adaptability of mechanisms to complex environments in continual transformation, where distinct interests must be accommodated to reduce potential conflicts. The evolution of the international agenda and the choices of relevant actors will determine if an international regime will be the way forward to accomplish that.

In any event, it is worth noticing that the effectiveness of a regime does not rely exclusively on its ability to solve existing problems. The emergence of permanent dialogue channels, the strengthening of relations between the

⁶⁵ Levy *et al.*, *supra* note 4 at 279.

⁶⁶ E.B. Weiss, Intergenerational Equity: a Legal Framework for Global Environmental Change, in: E.B. Weiss, (Ed.), *Environmental Change and International Law: New Challenges and Dimensions*, United Nations University Press, Tokyo, 1992, p. 412.

participants and the influence on shaping behaviors are also significant indicators of a regime's success and robustness, since they facilitate joint approaches towards current and future challenges, enabling more resilient institutions.

A regime built upon institutions capable of equating multiple interests towards converging expectations will potentially assure legal certainty and compliance, reducing conflicts and promoting stability and sustainability for space resource activities.

Despite the resistance to the MA, current governance initiatives are generally aligned with the treaty's parameters for an exploitation of space resources' international regime. Considering that the specificities of such a regime may be defined by the participants, this research raises an inspiring and probably controversial question: given the demands for space activities, could the development of an expanded international regime, supported by representative governance legitimized by new international actors, rescue and offer a breath of fresh air to the MA? Seemingly, it will not be long before we find out.