

THE BIG BANG OF SPACE GOVERNANCE: TOWARDS POLYCENTRIC GOVERNANCE OF SPACE ACTIVITIES

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Five space law treaties were introduced between 1967 and 1979. There have been no new treaties since, and none are expected in the foreseeable future. While international rulemaking is experiencing a decades-long gridlock, space activities, conducted by space agencies and commercial companies alike, are breaking new ground all the time. The result is an undersupply of rules, despite a growing market for governance. There is a demonstrated need for institutional innovation, which is currently motivating institutional entrepreneurship and even competition between various 'suppliers of governance.' Space governance is trending towards a polycentric model, as stakeholders and experts establish various forums ('governance centers'), that suggest, adopt, or lobby for a range of rules and standards. The result is the decentralized, incremental evolution of space governance. The U.S.-led Artemis Accords, for example, signed by eight countries in October 2020, look to create a semi-independent ecosystem of space governance, potentially laying the foundation of the governance of human space habitats for generations to come. Building on international law, international relations and political economy theories of decentralized governance, 'fragmentation', 'regime complexes,' and 'polycentric governance,' respectively, this paper suggests that polycentric governance, in the context of the regulation of space activities, is both inevitable and advantageous. It submits that the bottom-up development of space governance will lead to a more comprehensive, flexible, and up-to-date governance system than a top-down system could yield. Drawing upon, in part, Elinor Ostrom's Nobel winning study, this paper suggests that embracing and facilitating polycentricism, and diverting even more governance-building efforts in this direction, while mitigating adverse effects, would enhance space governance and space exploration by States and nonstate actors alike. The paper further rejects that space governance is, or should be, based on space being 'the province of all mankind', the 'common heritage of mankind' or the 'global commons.'

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I.	INTRODUCTION	486
II.	THE BIG BANG OF SPACE GOVERNANCE	497
	A. <i>The Big Bang Theory</i>	497
	B. <i>The Big Bang of Space Governance</i>	498
III.	THE RISE AND DEMISE OF MONOCENTRIC SPACE GOVERNANCE	499
	A. <i>The Concept of Global Governance</i>	499
	B. <i>The Emergence of Space Governance</i>	501
	C. <i>A Four Decade Stagnation</i>	504
	D. <i>In search for a better model for space governance</i> .	506
	E. <i>Progress through Decentralization: The Current State of Space Governance</i>	508
	F. <i>An emerging Artemis bloc?</i>	516
IV.	DECENTRALIZATION IN GLOBAL GOVERNANCE	519
	A. <i>Fragmentation</i>	521
	B. <i>Regime Complexes</i>	525
	C. <i>Polycentric Governance</i>	531
	D. <i>Cross-discipline Convergence of Theories</i>	536
V.	THE CASE FOR POLYCENTRIC SPACE GOVERNANCE .	538
	A. <i>Embracing Polycentricism</i>	538
	B. <i>The Key Role of Stakeholders and Experts in Space Governance</i>	540
	C. <i>Adapting the roles of the multilateral institutions</i>	546
	D. <i>Polycentric Space Governance and Space Law</i> ...	548
	E. <i>Maximizing the Advantages and Mitigating the Disadvantages of Polycentric Governance</i>	549
	i. <i>Ostrom's Design Principles for Robust Governance Systems</i>	550
	ii. <i>Institutional Deference</i>	552
	iii. <i>Standards for Decentralized Governance</i>	553
VI.	CONCLUSION	554

I. INTRODUCTION

This paper investigates the nature and architecture of modern space governance—exploring how it has evolved and how it will continue to evolve, given the absence of a global government or supreme authority. The paper examines closely how the standards and rules applicable to space activities are established, implemented, and reformed. This paper demon-

strates that after an initial period, ranging from the late 1950s to the mid 1970s, and defined by the successful development of space governance (which included significant institution-building and the adoption of numerous space law treaties), space governance has largely stagnated, the result of the decline in the rulemaking capacity of the key institutions. This development is consistent with the general trend in global governance institutions. Consequently, even the most important issues, e.g., space debris, militarization, and the utilization of natural space resources, are insufficiently addressed. The paper proceeds to review theories of decentralized governance, with the aim to suggest a feasible and effective model for space governance, that also possesses enough dynamism to facilitate the continuous evolution thereof. This paper, therefore, focuses on the *architecture* of global space governance, and not on the *content of the norms*. The paper argues that the only way to break through the current governance gridlock is to accept the move towards a polycentric model of space governance. In terms of policy recommendations, the paper suggests that instead of trying to fix the monocentric system we need to embrace and facilitate a decentralized, polycentric, governance system, i.e., relay and rely on the work of separate governance centers; divert governance-building efforts to the establishment and operation of these governance centers; acknowledge the major role of stakeholders and experts, and work to mitigate the adverse effects of polycentric governance.

To summarize the findings, I define space governance as the steering of human space activities by guiding the behavior of the relevant actors with the repertoire of applicable norms, principles, rules, policy instruments and other applicable instruments, and with the work of organizations, institutions and other fora. There are often assertions that space is the province of mankind, the common heritage of mankind and/or a global commons. If these assertions were true, they would guide and provide the basis for space governance, but they are not. Space is not the “province of mankind” as many argue, and it is mystifying how pervasive this notion is. Article I of the 1967 Outer Space Treaty (OST) clearly provides that “[t]he exploration and use of outer space . . . shall be the province of

all mankind.”¹ This language clearly identifies the activity, not the domain. Space is also not the “common heritage of mankind.” While the Moon Agreement declares parts of space to be so, it has not yet been ratified by a meaningful number of States, and, significantly, neither by major spacefaring States.² To a large extent, it was this very language that led many States to refrain from ratifying the Moon Agreement.³ Finally, space is not necessarily a ‘global commons.’ However, even if it is, the concept is of limited, even unclear meaning. It does not enhance our understanding of the nature of space governance beyond what is already established by the OST: that space is beyond national sovereignty (OST Article II) and that there is free access to space (OST Article I).⁴

The genesis of space governance in the first two decades after the Soviet launch of the first artificial earth satellite, Sputnik1, in 1957, saw a burst of norm-creating U.N. General Assembly (UNGA) declarations, adoption of space law treaties, and institutions building. The U.N. Committee on the Peaceful Uses of Outer Space (UN-COPUOS), established in 1958,⁵ adopted basic principles⁶ and then a constitution-like treaty—the 1967 Outer Space Treaty—that all garnered wide support.

1. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies art. 1, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205, [hereinafter Outer Space Treaty] (emphasis added).

2. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies art. 11, Dec. 18, 1979, 1363 U.N.T.S. 3, 18 I.L.M. 1434 [hereinafter Moon Agreement]; see also Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, U.N. Treaty Collection (Apr. 11, 2021), <https://perma.cc/U9DB-DYVA> (noting that only 22 States have signed or ratified the treaty).

3. Eytan Tepper, *Structuring the Discourse on the Exploitation of Space Resources: Between Economic and Legal Commons*, 49 SPACE POL’Y 101290, 101291 (2019) [hereinafter Tepper, *Structuring the Discourse*]. See also U.N. Committee on the Peaceful Uses of Outer Space, Report of the Legal Subcommittee on its Fifty-eighth Session, Held in Vienna from 1 to 12 April 2019, U.N. Doc. A/AC.105/1203 (Apr. 18, 2019).

4. *Id.*; see also Outer Space Treaty, *supra* note 1, art. 1 (noting that space “shall be free for exploration and use by all States”).

5. U.N. Office of Outer Space Affairs, COPUOS History, <https://perma.cc/U42W-7YRD> (last visited Nov. 3, 2021).

6. *E.g.*, G.A. Res. 1962 (XVIII), Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space (Dec. 13, 1963) [hereinafter Declaration of Legal Principles].

Specific provisions of the OST were subsequently elaborated in further treaties on the rescue of astronauts and spacecrafts,⁷ liability,⁸ and the registration of space objects.⁹ The last treaty on space natural resources, the aforementioned Moon Agreement,¹⁰ has admittedly not fared as well.¹¹ Space governance was thus launched as a fairly monocentric system with a single decision-making center: UN-COPUOS, mandated with creating and expanding the *corpus juris spatialis* and introducing legally binding and comprehensive treaties. However, no U.N. treaty has been adopted, nor amended since 1979, and this is not expected to change in the foreseeable future.¹² This corresponds to general trends in global politics, where global governance architectures, both legal and institutional, are fragmenting.¹³ The international system¹⁴ is decentralized and the

7. See Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Apr. 22, 1968, 19 U.S.T. 7570, 672 U.N.T.S. 119 [hereinafter Rescue Agreement] (noting in its preamble that it desires “to give further concrete expression to the rights and obligations” in the Outer Space Treaty).

8. See Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Space Liability Convention] (recalling, in its preamble, the Outer Space Treaty).

9. See Convention on Registration of Objects Launched into Outer Space, Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention] (recalling, in its preamble, that the Outer Space Treaty affirms State responsibility for national activities in space).

10. Moon Agreement, *supra* note 2.

11. See U.N. Committee on the Peaceful Uses of Outer Space, Status of International Agreements Relating to Activities in Outer Space as at 1 January 2021, U.N. Doc. A/AC.105/C.2/2021/CRP.10 (May 31, 2021) [hereinafter Moon Agreement Status] (noting that only 18 States have ratified and a further four States have signed the Moon Agreement).

12. See *id.* (noting that the only space-related treaties since the Moon Agreement in 1979 have been regional ones).

13. See Frank Biermann, Philipp Pattberg, Harro van Asselt, & Fariborz Zelli, *The Fragmentation of Global Governance Architectures: A Framework for Analysis*, 9 GLOBAL ENVTL POL. 14, 14 (2009) (arguing fragmentation “of governance in important issue areas of world politics” is a major concern); John Gerard Ruggie, *Global Governance and “New Governance Theory”: Lessons from Business and Human Rights*, 20 GLOBAL GOVERNANCE 5, 5 (2014) [hereinafter Ruggie, *Global Governance*] (noting that literature has identified a recent trend of “an already weak system of global governance apparently becoming more so”). See generally Study Group of the International Law Commission, *Fragmentation of International Law: Difficulties Arising from the Diversification and Expansion of International Law*, U.N. Doc. A/CN.4/L.682 (Apr.

monocentric system of space governance is thus a part of the decentralized system of global governance, which may help explain its deficiencies.

Decentralized governance in global affairs is inherent and inevitable, due to the absence of a global sovereign or supreme authority, what international relations scholars call the state of anarchy. One result is that international law is developed horizontally, rather than vertically.¹⁵ Moreover, in recent decades power in global politics is increasingly diffused; multilateral arrangements are ever more difficult to establish and even maintain as States strategically refrain from binding multilateral regimes,¹⁶ and multilateralism in general is contested.¹⁷ Leading States strategically refrain from binding multilateral regimes in order to maintain discretion, especially in view of the increase in the number of developing countries and their influence in multilateral fora.¹⁸ Add to that the barriers to cooperation in general—the problem of achieving and

13, 2006) [hereinafter *Fragmentation of International Law*] (addressing the risks ensuing from the fragmentation of international law).

14. For the purpose of this paper, I refer to the system created by the entirety of all States and other actors in global affairs, their actions and interactions, cooperation and creation of a normative framework. This system may be strong or fragile, but it is nevertheless a system.

15. See, e.g., P.E. CORBETT, *LAW AND SOCIETY IN THE RELATIONS OF STATES* 6–10 (1951) (noting the horizontal nature of international law occurs in part based on the sovereignty of States); MORTON A. KAPLAN & NICHOLAS B. KATZENBACH, *THE POLITICAL FOUNDATIONS OF INTERNATIONAL LAW* 20 (1961) (noting “the peculiar feature of international law-government is its horizontal structure of coequal authority”); Richard A. Falk, *The Reality of International Law*, 14 *WORLD POL.* 353, 355–56 (1962) (noting “the distinctive quality of international law” is that it is a “predominantly horizontal legal order”); Richard A. Falk, *International Jurisdiction: Horizontal and Vertical Conceptions of Legal Order*, 32 *TEMP. L. Q.* 295, 296–97 (1959) (comparing horizontal and vertical international law).

16. See Eyal Benvenisti & George W. Downs, *The Empire’s New Clothes: Political Economy and the Fragmentation of International Law*, 60 *STAN. L. REV.* 595, 610–11 (2007) [hereinafter Benvenisti & Downs, *The Empire’s New Clothes*] (noting that powerful states are increasingly using “strategic bilateralism” as a means of shaping international law).

17. See Julia C. Morse & Robert O. Keohane, *Contested Multilateralism*, 9 *REV. INT’L ORG.* 385, 386 (2014) (explaining the concept of “contested multilateralism” that describes both strategies and situations).

18. See Benvenisti & Downs, *The Empire’s New Clothes*, *supra* note 16, at 599 (explaining how developing states have sought to prevent fragmentation and promote their own interests in regulatory institutions).

maintaining collective action is probably as old as human grouping into societies. The result is the inevitability of decentralized global governance in general, and of decentralized space governance in particular. UN-COPUOS grew to become one of the largest U.N. committees and it became increasingly harder to adopt decisions by consensus, as is the customary procedure in the committee.¹⁹ Comprehensive monocentric governance is simply no longer feasible.

The Big Bang Theory explains the beginning and evolution of the universe. As the theory goes, there was a tiny nucleus or singularity, containing all matter that exists today, with infinite density and intense heat, and this nucleus expanded forming the universe we live in today.²⁰ Interestingly, space governance may be described in these terms. The main building blocks of space governance are, still today, those elaborated above. Yet, with the diminishing rulemaking capability of UN-COPUOS, the twenty-first century has seen a gradual, yet steady, emergence of smaller issue-specific forums, led by experts and stakeholders, that introduce various instruments, notably soft law instruments on issues such as space debris, military uses of space, and the exploitation of natural space resources. Thus, the initial monocentric, quasi-hierarchical structure of space governance is experiencing a slow-motion big bang, by which the basic, early building blocks persist, but the subsequent expansion and evolution of space governance is decentralized. The inevitable future of space governance is various fora or decision-making centers ('governance centers'), with various participants introducing various outputs for distinct sub-issues. Nevertheless, UN-COPUOS remains the most important forum and the U.N. Office for Outer Space Affairs (UNOOSA), the most important agency. Space governance is thus in transition to being polycentric.

The theoretical framework of this paper incorporates three disciplines as it discusses, compares, demonstrates the

19. See U.N. Committee on the Peaceful Uses of Outer Space, Compendium on Rules of Procedure and Methods of Work Related to the United Nations Committee on the Peaceful Uses of Outer Space and its Subsidiary Bodies, U.N. Doc. A/AC.105/2016/CRP.5 (June 1, 2016) (noting how UN-COPUOS decisions are customarily made by consensus).

20. See generally STEVEN WEINBERG, *THE FIRST THREE MINUTES: A MODERN VIEW OF THE ORIGIN OF THE UNIVERSE* (2nd ed. 1993) (detailing what happened at the beginning of the universe).

convergence of, and builds on the literature of three concepts, each a version or conceptualization of decentralized governance: ‘regime complexes’ (IR), polycentric governance (political economy/institutional analysis), and fragmentation (international law). Significantly, the political economy literature provides empirical grounding for this paper’s theories and policy recommendations. Governance is as much a political science issue as it is an issue of law. Moreover, the study of global governance emerged within the discipline of IR, which arguably still leads the discourse on global governance. For the purposes of this investigation, I employ the IR literature on international regimes (regime theory), which later evolved into the study of global governance, and its recent conceptualization of ‘regime complexes.’ Political economy’s institutional analysis, and in particular Elinor Ostrom’s Nobel Prize-winning study on the governance of common-pool resources, provides another important pillar of the investigation herein.²¹ E. Ostrom’s research included a wide empirical base of lab experiments, field studies, and meta-analysis of a vast database of existing case studies from around the world,²² and in this lies the strength of her study. The empirical results support the theory of polycentric governance and its merits as developed by Vincent and Elinor Ostrom and other scholars of the Bloomington School of Political Economy.²³ The transdiscipli-

21. *E.g.*, Elinor Ostrom, *Beyond Markets and States: Polycentric Governance of Complex Economic Systems*, 100 *AM. ECON. REV.* 641, 641 (2010) [hereinafter E. Ostrom, *Beyond Markets and States*] (explaining the variety of studies Elinor Ostrom has conducted on the governance of common-pool resources).

22. *Id.* at 641, 645, 656. The studies were conducted by anthropologists, economic historians, engineers, historians, philosophers, and political scientists who studied local governance of smaller to medium scale common-pool resources over long periods of time. *Id.* at 649. The studies followed different types of resources located in many States, including Bolivia, Colombia, Guatemala, India, Kenya, Mexico, Nepal, Tanzania, Thailand, Uganda, Ethiopia, China, and the United States. *Id.* at 657.

23. This journey started with Vincent Ostrom, Charles M. Tiebout, and Robert Warren in 1961 and culminated with Elinor Ostrom’s 2009 Nobel lecture. *See e.g.*, E. Ostrom, *Beyond Markets and States*, *supra* note 21 (reflecting a revised version of the lecture Elinor Ostrom delivered upon receiving the Nobel Prize that summarized her life’s work); Vincent Ostrom, Charles M. Tiebout & Robert Warren, *The Organization of Government in Metropolitan Areas: A Theoretical Inquiry*, 55 *AM. POL. SCI. REV.* 831 (1961) (introducing the concept of a “polycentric political system”).

nary nature of this paper's inquiry thus anchors the conclusions of the paper in both theory and empirical findings

Fragmentation in international law is the proliferation of legal instruments and tribunals on a single issue, with partial overlap but no hierarchy. In the IR literature, a 'regime complex' describes an array of partially overlapping and nonhierarchical regimes, often with conflicting rules, governing a particular issue-area. These two concepts describe basically the same phenomenon. Polycentric governance is a system of governance in which there are simultaneously multiple independent governance centers with at least partial overlap in jurisdictions.²⁴ Think, for example, of the policing function of the government that may be exercised, simultaneously, by the federal police, state police and city police, with a certain overlap in their respective jurisdictions.²⁵ Regime complexes, fragmentation and polycentric governance are three versions or conceptualizations of decentralized governance where the power or rules are not to be found in one place—a single institution or legal instrument—nor in a hierarchical set of institutions and legal instruments. The literature on regime complexes and on fragmentation demonstrates the increasing rate of decentralization in global affairs.²⁶ The cumulative insights from the literatures on the above three concepts is that governance in global affairs is increasingly and inevitably decentralized, and that though it has adverse effects, its advantages arguably outweigh those adverse effects. Significantly, it enables the evolution of governance under the constraint of anarchy in international relations. It is the only way out of the enduring gridlock that prevents the continuous evolution of space governance.

Furthermore, Elinor Ostrom devised, based on the vast empirical database, eight design principles for robust governance systems.²⁷ Adjusted to the context of space governance,

24. V. Ostrom, Tiebout & Warren, *supra* note 23, at 831.

25. *See id.* (explaining a governance system with overlapping jurisdictions).

26. *See, e.g.,* Ruggie, *Global Governance*, *supra* note 13, at 5–6 (noting literature reflects increasing trends of fragmentation and regime complexes coming to dominate rule systems).

27. *See* Michael E. Cox, Gwen Arnold & Sergio Villamayor Tomás, *A Review of Design Principles for Community-Based Natural Resource Management*, 15 *ECOLOGY & SOC'Y* 663, 663, 670 (2010) (analyzing what theoretical issues

these principles would be met if: (i) there is a clear definition of the sub-issue-area and its users/stakeholders; (ii) there is a balanced proportion between the users' contribution and benefits; (iii) the users participate in the making and modifying of the rules; (iv) the monitoring and sanctioning is carried out by the users themselves or by someone who is accountable to the users; (v) the sanctions are graduated; (vi) there is a dispute-resolution mechanism; (vii) the right of users to self-organize is clearly recognized by outside authorities; and (viii) the issue-area-specific governance center is nested in the larger governance system of space governance.²⁸

This paper calls for embracing polycentric governance, namely facilitating and encouraging the evolution of separate governance centers on each sub-issue. Polycentric space governance means the incremental, bottom-up, evolution of space governance, as each sub-issue regime evolves at a different pace according to the degree of urgency, type of challenges and agreement between the actors.²⁹ It means that the governance of each issue evolves within a different forum, with partial overlap in their jurisdiction or focus, run by different actors, and by the adoption of various instruments, legally-binding or not, multilateral, or national, or industry standards and best practices. A single issue can even have more than one forum, e.g., one multilateral and one industry forum. This development will occur in a kind of spontaneous order, as stakeholders establish forums that suggest, adopt or push for rules and standards. The aggregate of all these instruments and forums will be a more comprehensive and updated governance system than a monocentric system of global governance and, moreover, one that is increasingly flexible to adapt to changes. Flexibility is especially important given the expected changes and disruptions in technologies and commercial models. Central to polycentric governance is users' self-governance, i.e. that the users themselves establish, modify and possibly enforce the rules. The evidence shows that users establish rules that better

have arisen since Elinor Ostrom introduced the eight design principles in 1990).

28. *Id.* tbl. 3.

29. *Cf.* Scott J. Shackelford, *Governing the Final Frontier: A Polycentric Approach to Managing Space Weaponization and Debris*, 51 AM. BUS. L. J. 429 (2014) (demonstrating "some of the benefits and drawbacks of a polycentric approach").

suit the conditions and needs and tend to follow those rules more than they would follow rules imposed from above. Users, or stakeholders, in space currently include also private actors, and they also take part in governance centers, in various capacities. UNOOSA is best positioned to represent the global public interests and the interests of prospective and affected actors. This architecture of space governance is neither a central authority nor a “power vacuum.” Neither anarchy nor state nor even utopia.³⁰ It is a flexible polycentric system with numerous semi-autonomous, but interconnected governance centers.

In terms of policy recommendations, the paper suggests that instead of trying to fix the monocentric system we need to embrace and facilitate a decentralized, polycentric, governance system, i.e., relay and rely on the work of separate governance centers; divert governance-building efforts to the establishment and operation of these governance centers; acknowledge the major role of stakeholders and experts, and work to mitigate the adverse effects of polycentric governance.

Decentralized governance has adverse effects which include redundancy and inconsistency. It raises concerns of regulatory oversight deficit and raises questions of participation, accountability and bias towards powerful States and other powerful actors. Nevertheless, the multiplicity of actors participating in decentralized governance provides balance. Furthermore, the advantages of decentralized governance can be maximized, and its adverse effects can be mitigated if governance centers meet Ostrom’s design principles for effective institutions,³¹ if institutional deference is practiced,³² and if the standards of “global administrative law” are applied.³³ Pratt con-

30. Cf. ROBERT NOZICK, *ANARCHY, STATE, AND UTOPIA* (1974) (explaining governance mechanisms in the state of nature, restrictions that should be placed on the state, and the qualities of a modern utopia).

31. See E. Ostrom, *Beyond Markets and States*, *supra* note 21, at 652–53 (outlining Ostrom’s right principles that “affect the probability of long-term survival of an institution”).

32. See Tyler Pratt, *Deference and Hierarchy in International Regime Complexes*, 72 INT’L ORG. 561, 562–64 (2018) (exploring the concept of institutional deference, or one international organization’s “acceptance of another organization’s exercise of authority”).

33. See Benedict Kingsbury, *The Concept of ‘Law’ in Global Administrative Law*, 20 EUR. J. INT’L L. 23, 31–41 (2009) (arguing for the existence of a workable concept of law in global administrative law because of the growing use of publicness criteria by public entities); Benedict Kingsbury, Nico

ceptualized the practice of “institutional deference,” where international organizations accept the exercise of authority by another international organization on specific issues and thereby mitigate potential conflicts and facilitate a division of labor within a regime complex.³⁴ If various governance centers practice institutional deference, it will alleviate the adverse effects of decentralized governance, as it will reduce redundancy and inconsistency by reducing the scope of conflicting rules and jurisdictions.³⁵ In addition, global administrative law provides modern standards for global administration that may be applied in and across the various governance centers.³⁶ These standards address issues of accountability, transparency, participation, reasoned decision, and legality and may strengthen the legitimacy of the governance centers.³⁷

Section II of this paper presents the slow-motion ‘big bang’ of space governance, by which it is on track to become polycentric. Section III of this paper presents the crisis in global space governance and the search for alternative models for space governance. Section IV presents the theoretical underpinnings of this paper, the knowledge on fragmentation, regime complexes and polycentric governance. It further demonstrates the cross-discipline convergence between them. Section V presents the case for polycentric governance in global affairs and in space governance in particular. It suggests a key role of stakeholders and experts in space governance, and portrays how polycentric space governance may look like in practice. It further discusses ways to maximize the benefits and mitigate the adverse effects of polycentric governance systems. The conclusions of the paper are then summarized.

Krisch & Richard B. Stewart, *The Emergence of Global Administrative Law*, 68 L. & CONTEMP. PROBS. 15 (2005) (defining global administrative law as “comprising the mechanisms, principles, practices, and supporting social understandings that promote or otherwise affect the accountability of global administrative bodies”).

34. Pratt, *supra* note 32, at 562–63, 579.

35. *See id.* at 563 (explaining how “conflicts between states and international institutions or between subnational authorities may require similar decentralized coordination strategies”).

36. *See* Kingsbury, Krisch & Stewart, *supra* note 33, at 28, 57 (calling for a “modern positivist approach” to the concept of global administrative law but noting “shared principles . . . in various public law systems” have “an increasing normative pull”).

37. *Id.* at 25, 37.

II. THE BIG BANG OF SPACE GOVERNANCE

A. *The Big Bang Theory*

The Big Bang theory is the leading explanation of the beginning and evolution of the universe. It is a combination of astronomical observations and mathematical models and the product of the work of numerous scientists.³⁸ As the theory goes, our universe expanded from a small nucleus or initial singularity, which contained all matter and had infinite density and intense heat.³⁹ Around 14 billion years ago, the big bang occurred.⁴⁰ At this moment, the singularity began expanding, and it has been expanding ever since, at an accelerating pace, forming the universe we live in today.⁴¹ From the first moment, the universe contained a vast array of fundamental particles comprising all that currently exists, mixed with light and energy.⁴² The tiny particles grouped together, forming atoms that grouped together to form stars and galaxies.⁴³ Over the lifetime of the universe, galaxies will group together and crash and stars are born and die, creating asteroids, comets, planets, and black holes.⁴⁴ The Big Bang theory accounts for the expansion of the Universe as an eternal inflation.⁴⁵

38. These scientists include: Vesto Slipher, Alexander Friedmann, Albert Einstein, Edwin Hubble, Georges Lemaître and George Gamow, Stephen Hawking and Alan Guth. *See generally* Emmanuel Leghara Ikipendu & Datti Ahmed Shinge, *An Overview of the Cosmological Big Bang Theory of the Universe*, 18 AFR. SCHOLAR J. AGRIC. & AGRIC. TECH. 105 (2020) (providing an overview of the big bang and the contributions that led to the theory's development).

39. *Id.* at 119.

40. *See id.* at 118 (noting some estimates place the age of the universe at about 13.8 billion years old).

41. *Id.* at 113, 115.

42. *Id.* at 106.

43. *Id.*

44. *See generally* WEINBERG, *supra* note 20 (discussing the theory of the origin of the universe).

45. Stephen W. Hawking & Thomas Hertog, *A Smooth Exit from Eternal Inflation?*, 2018 J. HIGH ENERGY PHYSICS 1, 1 (questioning the dynamics of eternal inflation). Stephen Hawking's final theory of the big bang, as published in a paper co-authored with Thomas Hertog and submitted for publication shortly prior to his death, deviates from the eternal inflation convention. *Id.* Based on "string theory," Hawking and Hertog predicted that the universe is globally finite and reasonably smooth, significantly simpler than portrayed by the widely accepted theories. *See id.* at 10 (arguing that the exit from eternal inflation "produces classical universes that are reasonably smooth on the largest scales").

Space governance can be described with the terminology of Big Bang theory. The basic particles of space governance, as introduced at the genesis of space exploration, are the nucleus from which space governance has expanded and is still expanding. Unlike the actual Big Bang, not all the current particles of space governance were contained in this nucleus, and whereas the timespan of the big bang was a fraction of a second, the one of space governance is measured in decades. Nevertheless, space governance is experiencing a Big Bang, as this section suggests, and subsequent sections will confirm.

B. *The Big Bang of Space Governance*

Centralization is an efficient way to establish a new regime. However, a centralized and coherent governance system is often fragile, as centralization has distinct costs and deficiencies, which accumulate over time. These include rigidity, insufficient adaptation to the interests of various actors and changing realities and free riders. The costs and deficiencies drive even initially centralized and coherent governance systems towards decentralization. The evolution of space governance demonstrates this evolutionary pattern. It started as a fairly monocentric system and through this centralized system, a comprehensive and universally accepted set of legally binding treaties were introduced. However, after this first stage of progress faded in the mid-1970s, the pendulum started to swing towards a more decentralized, and even polycentric, governance structure. This is the Big Bang of space governance: the expansion of space governance from a small nucleus of a single committee (UN-COPUOS) and four widely-accepted treaties, to a system in which there are numerous forums introducing many instruments. The new forums and instruments build on, complement and extend the nucleus. They are mostly issue-specific, of various types and with various participation, coherence, comprehensiveness, acceptance and legal force. Gradually, each sub-issue may have a different governance system, with a distinct forum or forums, instruments and level of coherence and implementation. Section III(E) below reviews the current governance of five sub-issues and demonstrates the overall decentralization and divergence of the governance systems.

III. THE RISE AND DEMISE OF MONOCENTRIC SPACE GOVERNANCE

A. *The Concept of Global Governance*

The concept of space governance, or global space governance, is derived from the concept of global governance. Global governance is a wide term that is “notoriously slippery.”⁴⁶ Many have struggled to define it,⁴⁷ and others criticized the concept for allegedly having an underlying agenda, ignoring the Global South, or being analytically misleading.⁴⁸ The concept—and now a field of study—“global governance” was introduced by Rosenau and Czempiel in 1992 as something different than government.⁴⁹ The underlying observation was that it is a myriad of actors and forms of authority, formal and informal, which steer behavior in the global arena.⁵⁰ Ques-

46. Thomas G. Weiss & Rorden Wilkinson, *Rethinking Global Governance? Complexity, Authority, Power, Change*, 58 INT'L. STUD. Q. 207, 207 (2014).

47. E.g., United Nations Dev. Programme (UNDP), *Human Development Report (1999)* (calling for a “coherent and more democratic architecture for global governance in the 21st century”); ADIL NAJAM, MIHAELA PAPA & NADAA TAIYAB, *GLOBAL ENVIRONMENTAL GOVERNANCE: A REFORM AGENDA 9* (2006) (defining global governance as “the sum of organizations, policy instruments, financing mechanisms, rules, procedures and norms that regulate global environmental protection”); COMM'N ON GLOB. GOVERNANCE, *OUR GLOBAL NEIGHBORHOOD: THE REPORT OF THE COMMISSION ON GLOBAL GOVERNANCE 2* (1995) (noting governance “is the sum of the many ways individuals and institutions, public and private, manage their common affairs” and “a continuing process through which conflicting or diverse interests may be accommodated and co-operative action may be taken”); THOMAS G. WEISS & RAMESH THAKUR, *GLOBAL GOVERNANCE AND THE UN: AN UNFINISHED JOURNEY xi* (2010) (noting how global governance is “generally defined by a critical absence” of a global government); Lawrence S. Finkelstein, *What Is Global Governance?*, 1 GLOBAL GOVERNANCE. 367, 367 (1995) (noting how the term global governance “reflects inescapable ambiguity about the nature of the ‘international system’”); James N. Rosenau, *Governance in the Twenty-First Century*, 1 GLOBAL GOVERNANCE. 13, 14 (1995) (noting how global governance “encompasses the activities of governments, but it also includes the many other channels through which ‘commands’ flow in the form of goals framed, directives issued, and policies pursued”).

48. Henk Overbeek et al., *Forum: Global Governance: Decline or Maturation of an Academic Concept?*, 12 INT'L. STUD. REV. 696, 696–97 (2010).

49. James N. Rosenau, *Governance, Order, and Change in World Politics*, in *GOVERNANCE WITHOUT GOVERNMENT: ORDER AND CHANGE IN WORLD POLITICS 1–29* (James N. Rosenau & Ernst-Otto Czempiel eds., 1992) (explaining the “presence of governance without government”).

50. *Id.* at 4.

tions regarding the meaning of the concept soon arose. As early as 1995, when the concept of global governance was still in its cradle, Finkelstein's article in the first issue of the journal *Global Governance* asked in its title, "What Is Global Governance?"⁵¹ Finkelstein's provocative answer was: "'global governance' appears to be virtually anything."⁵²

The word 'governance' comes from the Greek word "*kubernaein*" which means to steer, to guide, direct.⁵³ It is defined in dictionaries as the "action or manner of governing"⁵⁴ or "the way that organizations or countries are managed at the highest level, and the systems for doing this."⁵⁵ I define global governance as *the steering of global affairs*,⁵⁶ which is made mainly by *guiding the behavior of actors in global affairs*. What guides the behavior of actors in global affairs, is mainly the repertoire of applicable norms, principles, rules, policy instruments and other applicable instruments and the work of organizations, institutions, and other *fora*. Unilateral actions also influence global affairs, especially those of powerful States, as well as other non-multilateral actions and agreements, by and between the various actors and *fora*, to the extent that they influence the behavior of other actors in global affairs. This definition views governance as dynamic in nature—a *process*—not a static picture of the sum of norms, rules etc., captured in a single moment in time.⁵⁷

51. Finkelstein, *supra* note 47, at 368.

52. *Id.*

53. *Govern*, *v.*, OXFORD ENGLISH DICTIONARY, <https://perma.cc/YUV2-E49D> (last visited Oct. 19, 2021).

54. *Governance*, LEXICO, <https://perma.cc/G5S4-AGUB> (last visited Oct. 19, 2021).

55. *Governance*, CAMBRIDGE DICTIONARY, <https://perma.cc/S4C4-CDQX> (last visited Nov. 6, 2021).

56. This definition draws from a definition associated to Adil Najam, a beautifully simple definition: that global governance is "the management of global processes in the absence of global government." See Malcolm D. Childress, *International Natural Resources Governance Initiatives*, in *ADAPTIVE CROSS-SCALAR GOVERNANCE OF NATURAL RESOURCES* 55–74, 56 (Grenville Barnes & Brian Child eds., 2014) (noting Najam's purported definition, without a direct quote).

57. Weiss and Thakur define global governance as "the sum of laws, norms, policies, and institutions that define, constitute, and mediate trans-border relations between states, citizens, intergovernmental and nongovernmental organizations, and the market." WEISS & THAKUR, *supra* note 47, at 31–32.

Global space governance, or simply space governance, is the governance of an issue-area in global affairs: the issue-area of human space activities and outer space. It includes (i) the governance of human space activities; (ii) the governance of human installations in space, e.g., the International Space Station (ISS). In future, it will further include (iii) the governance of areas and resources in space that are used or claimed by humans; and (iv) the governance of human colonies in space. Whereas States have jurisdiction on human installations registered with them, the areas and resources in space are beyond national jurisdictions and are considered by many to be a 'global commons.' Whether or not these areas and resources are actually a 'global commons', is discussed elsewhere.⁵⁸ Space governance is therefore the steering of human space activities by guiding the behavior of the actors conducting them. This guidance stems from rules and fora, broadly defined to include the repertoire of applicable norms, principles, rules, policies, and other applicable instruments, whether or not they are legally-binding, and the work of organizations, institutions, and other fora, whether or not they are formal.

B. *The Emergence of Space Governance*

The governance of space activities had a promising beginning. The first two decades saw a burst of norms creating U.N. General Assembly (UNGA) declarations, space law treaties, and institutions building. Those were the glory days of space governance—when all the principles and rules we have today (and still try to make sense of) were adopted. Within a year from the Soviet launch of the first artificial earth satellite, Sputnik 1, on October 1, 1957, the UNGA adopted a resolution introducing basic aspirations and norms,⁵⁹ and established the U.N. Committee on the Peaceful Uses of Outer Space (UN-COPUOS).⁶⁰ UN-COPUOS, in turn, was “instru-

58. See, e.g., Tepper, *Structuring the Discourse*, *supra* note 3, at 4–9 (addressing whether elements of space are economic or legal commons).

59. The basic aspirations norms, still recognized today, are the peaceful use of space, the common interest of mankind in space, international cooperation in space activities, promoting exploration and exploitation of space for the benefit of mankind, and wishing to avoid the extension of national rivalries into space.

60. G.A. Res. 1348 (XIII), (Dec. 13, 1958). This resolution established an ad hoc committee that became a permanent committee by a UNGA resolu-

mental”⁶¹ in the preparation and adoption of the 1963 UNGA Declaration setting the principles of space law,⁶² and the five space law treaties introduced between 1967 and 1979. The treaties were all initially negotiated in and adopted by UN-COPUOS, with negotiations being led by the United States and the Soviet Union, and later adopted by the UNGA and ratified by States.⁶³ Of the five treaties, the 1967 Outer Space Treaty (OST)⁶⁴ is the most important, as it established the basic norms and principles of space law, and may be regarded as the “constitution” of space. The OST was followed by four treaties, each expanding on specific provisions of the OST: one on the rescue of astronauts and spacecrafts,⁶⁵ one on liability,⁶⁶ one on the registration of space objects with the United Nations,⁶⁷ and one on the utilization of natural resources on celestial bodies in the solar system.⁶⁸ Unlike the first four treaties, which gained wide acceptance and ratification, this fifth and, so far, last space law treaty, known as the Moon Agreement of 1979, gained ratification from merely eighteen States, none of them main spacefaring nations.⁶⁹ While the Moon Agreement gathered enough ratifications to enter into force, it is not binding on most States. While the Moon Agreement is often used in legal analysis, its generally non-binding status

tion a year later. *Id.* ¶ 1; G.A. Res. 1472 (XIV), ¶ 1, International Co-operation in the Peaceful Uses of Outer Space (Dec. 12, 1959).

61. United Nations Office for Outer Space Affairs, Committee on the Peaceful Uses of Outer Space, <https://perma.cc/U4ZW-ZD4D> (last visited Nov. 7, 2021). *See also* MANFRED LACHS, *THE LAW OF OUTER SPACE: AN EXPERIENCE IN CONTEMPORARY LAW-MAKING* 30 (1972) (noting that the “Committee has become the main centre of international co-operation and co-ordination in the field of the exploration and peaceful uses of outer space”).

62. Declaration of Legal Principles, *supra* note 6, pmbl.

63. *See* LACHS, *supra* note 61, at 30 (noting the importance of the subcommittees of UN-COPOUS to negotiating treaties); *e.g.*, Vladimír Kopal, *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies: Introductory Note*, AUDIOVISUAL LIBR. OF INT’L L. (Sept. 2008), <https://perma.cc/R3NP-7HTT> (noting how the Outer Space Treaty was negotiated in the Legal Subcommittee of COPOUS, largely by the Soviet Union and the United States).

64. Outer Space Treaty, *supra* note 1.

65. Rescue Agreement, *supra* note 7.

66. Space Liability Convention, *supra* note 8.

67. Registration Convention, *supra* note 9.

68. Moon Agreement, *supra* note 2.

69. Moon Agreement Status, *supra* note 11.

mandates caution with such use.⁷⁰ As of today, it does not represent wide agreement on what States perceive as applicable rules.⁷¹ All told, there are four widely accepted and binding space law treaties.

In addition, there are five major UNGA declarations on space issues, that although not legally binding,⁷² provide a widely accepted normative framework on several issues. These are the above mentioned 1963 Declaration of legal principles governing States' space activities,⁷³ the 1982 Declaration on the use of satellites for direct television broadcasting,⁷⁴ the 1986 Declaration on remote sensing,⁷⁵ 1992 Declaration on the use of nuclear power sources in space,⁷⁶ and the 1996 Declaration on international cooperation and space benefits.⁷⁷

It is UN-COPUOS and its legal sub-committee that are entrusted with the development of space law. The UNGA resolution establishing the committee has stipulated its mandate, which includes: “[t]o study the nature of legal problems which

70. See, e.g., Shadi A. Alshdaifat, *Who Owns What in Outer Space? Dilemmas regarding the Common Heritage of Mankind*, 2018 PECS J. INT'L & EUR. L. 21, 32–33 (2019) (comparing the Moon Agreement with the Outer Space Treaty).

71. Moon Agreement Status, *supra* note 11.

72. See Stephen M. Schwebel, *The Effect of Resolutions of the U.N. General Assembly on Customary International Law*, 73 PROC. ANN. MEETING (AM. SOC'Y INT'L L.) 301, 301 (1979) (noting that General Assembly resolutions “are not, generally speaking, binding”).

73. Declaration of Legal Principles, *supra* note 6.

74. G.A. Res. 37/92, annex, Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (Dec. 10, 1982) [hereinafter Broadcasting Principles].

75. G.A. Res. 41/65, annex, Principles Relating to Remote Sensing of the Earth from Outer Space (Dec. 3, 1986) [hereinafter Remote Sensing Principles].

76. G.A. Res. 47/68, Principles Relevant to the Use of Nuclear Power Sources in Outer Space (Dec. 14, 1992) [hereinafter Nuclear Power Sources Principles].

77. G.A. Res. 51/122, annex, Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (Dec. 13, 1996) [hereinafter Benefits Declaration]. The list of declarations and their full versions are available online. United Nations Office for Outer Space Affairs, Space Law Treaties and Principles, <https://perma.cc/H22V-CFEW> (last visited Nov. 7, 2021).

may arise from the exploration of outer space.”⁷⁸ The current paralysis in UN-COPUOS, together with the conditions of global politics (that contributed to paralysis in UN-COPUOS in the first place), are the major factors in the crisis of space governance. The next section reviews this crisis.

C. *A Four Decade Stagnation*

As the former Chair of UN-COPUOS noted, “the rules that have been codified in the series of treaties signed and ratified almost 60 years ago . . . are showing their age.”⁷⁹ Yet no new, legally binding treaty has been adopted since 1979,⁸⁰ and this is not expected to change in the foreseeable future. Instead, several soft law instruments were adopted in the form of UNGA resolutions and declarations.⁸¹ The legally binding space law rules, unchanged since the 1970s, fail to sufficiently address even the most important and pressing challenges, notably military uses of space, space debris, and the utilization of natural space resources. Treaty-based space law can no longer evolve to meet the emerging challenges of space exploration and utilization. According to the procedure at UN-COPUOS, decisions are made by consensus, which lends significant acceptance and legitimacy, but also stalls or even prevents decision-making.⁸² The committee is practically paralyzed,⁸³ de-

78. G.A. Res. 1472 (XIV), *supra* note 60. See also G.A. Res. 1348 (XIII), *supra* note 60 (adopting similar language).

79. David Kendall, *Second Foreword*, in *GLOBAL SPACE GOVERNANCE: AN INTERNATIONAL STUDY* xi (Ram S. Jakhu & Joseph N. Pelton eds., 2017).

80. UNIDROIT’s 2012 Berlin Space Assets Protocol to the 2001 Cape Town Convention on International Interests in Mobile Equipment is one exception. Protocol to the Convention on International Interests in Mobile Equipment on Matters specific to Space Assets, Mar. 9, 2012, 2307 U.N.T.S. 285 [hereinafter *Space Assets Protocol*]; Cape Town Convention on International Interests in Mobile Equipment, Nov. 16, 2001, 2307 U.N.T.S. 285 [hereinafter *Cape Town Convention*].

81. *E.g.*, Broadcasting Principles, *supra* note 74; Remote Sensing Principles, *supra* note 75; Nuclear Power Sources Principles, *supra* note 76; Benefits Declaration, *supra* note 77; G.A. Res. 70/26 (Dec. 7, 2015) (adopting a resolution on the prevention of an arms race in outer space); G.A. Res. 69/32 (Dec. 2, 2014) (adopting a resolution on preventing the first placement of weapons in outer space).

82. FRANCIS LYALL & PAUL B. LARSEN, *SPACE LAW: A TREATISE* 17–22 (2nd ed. 2009).

83. Ram S. Jakhu, *Sixty Years of Development of International Space Law* 19 (Apr. 8, 2016), <https://perma.cc/4AWB-W3EJ>.

void of the capacity to continue to develop space law.⁸⁴ Hard space law, and with it the existing system of space governance, based on UN-COPUOS multilateral rulemaking, has been stagnating for nearly four decades with no signs of change. The prolonged gridlock puts the system of space governance at risk of gradually losing its relevance. *There is widespread acknowledgment of the need for change, but there is no emerging consensus on what kind of change and how to accomplish it.*⁸⁵

Governance gaps are already starting to be filled in various ways. Some States have already resorted to unilateral action, whether by developing space weapons and executing anti-satellite (ASAT) tests, or by national legislation, in what may become a trend of retreat from multilateral arrangements. Notably, in 2015 the United States adopted a law granting U.S. companies property rights in any natural space resources they obtain.⁸⁶ Luxemburg followed suit in 2017⁸⁷ and the UAE intends to do the same.⁸⁸ Another response to the governance gap, is a retreat from the wide multilateral forum of UN-COPUOS to a small, stakeholders-based fora, such as

84. See Tare Brisibe, *Parliamentary Diplomacy in the United Nations and Progressive Development of Space Law*, 18 EUR. J. L. REFORM 6, 22–29 (2016) (describing the current impasse at UN-COPUOS); Eilene M. Galloway, *Consensus Decisionmaking by the United Nations Committee on the Peaceful Uses of Outer Space*, 7 J. SPACE L. 3, 9–11 (1979) (describing the reasons for the difficulties attaining consensus); see also Rajeswari Pillai Rajagopalan, *Space Governance*, OXFORD RES. ENCYCLOPEDIA PLANETARY SCI. (Aug. 28, 2018), <https://perma.cc/K8AU-KLET> (last visited Feb. 17, 2019) (noting the need for new rules on space governance and that current efforts to develop measures have been unsuccessful so far).

85. See Kai-Uwe Schrogl, *The New Debate on the Working Methods of the UN-COPUOS Legal Subcommittee*, 105 ACTA ASTRONAUTICA 101, 104 (2014) (predicting the Legal Subcommittee will enter a period “characterized by the understanding for the need of change but no merging consensus on how to accomplish” it); see also Brisibe, *supra* note 84, at 7 (noting the absence of agreement between member states on how to restructure the Legal Subcommittee’s agenda).

86. U.S. Commercial Space Launch Competitiveness Act, 51 U.S.C. § 51302 (2018).

87. LOI DU 20 JUILLET 2017 SUR L’EXPLORATION ET L’UTILISATION DES RESOURCES DE L’ESPACE, [JOURNAL OFFICIEL DU GRAND-DUCHÉ DE LUXEMBOURG, LAW ON THE EXPLORATION AND USE OF SPACE RESOURCES] (July 20, 2017), <https://perma.cc/3HLG-783Y>.

88. Lucy Barnard, *UAE to Finalise Space Laws Soon*, THE NAT’L (Mar. 7, 2016) <https://perma.cc/T73Y-SPNF>.

the forum of space agencies that adopted guidelines on the mitigation of space debris.⁸⁹

While there are challenges regarding the governance of sub-issue-areas in space governance (e.g., the issues of natural space resources, military uses, space debris and space traffic control), *the overarching challenge is to the system itself*.⁹⁰ As Rajagopalan noted:

there are several challenges facing the global governance of space, but the critical one is the lack of consensus among major spacefaring powers and the crisis in decision-making, which has paralyzed the process of developing an effective outer space regime. Though there are a few legal instruments in place, they have been proven to be increasingly ineffective.⁹¹

Indeed, there is a crisis in global space governance that threatens the relevance of the key institutions and rules altogether. As Finnemore noted, effectiveness is “crucial to the trajectory of global governance[,] . . . [i]neffective governance and bad performance can damage the authority and, thereby, the power of governing structures.”⁹²

The crisis in space governance is central to a system-wide phenomenon across all areas of global governance. Indeed, “[t]raditional forms of international legalization and negotiation through universal consensus-based institutions are stagnating.”⁹³ The deficiencies and challenges of space governance have led to a search for a better model for space governance.

D. *In search for a better model for space governance*

The crisis in space governance has not escaped the notice of the space community. The 2014 Manfred Lachs International Conference, organized by the McGill University Institute of Air and Space Law and held in Montréal, was devoted

89. INTER-AGENCY SPACE DEBRIS COORDINATION COMM., IADC SPACE DEBRIS MITIGATION GUIDELINES 3–4 (2007).

90. Rajagopalan, *supra* note 84, at 16.

91. *Id.*

92. Martha Finnemore, *Dynamics of Global Governance: Building on What We Know*, 58 INT’L STUD. Q. 221, 222 (2014).

93. Ruggie, *Global Governance*, *supra* note 13, at 5.

to this issue, under the general theme of Global Space Governance. The conference culminated with the Montréal Declaration, which noted that “the current global space governance system that was created during the 1960s and 1970s has not been comprehensively examined by the international community since . . . [although] numerous developments have occurred . . . with serious implications.”⁹⁴ The Declaration further asserted that “the time has come to . . . propose an appropriate global space governance system.”⁹⁵ The Institute subsequently launched an international study, the outcomes of which were published⁹⁶ and presented at various international *fora*.⁹⁷ The study explores the existing mechanisms of global governance, regional and national perspectives, and around twenty specific issue-areas (e.g., satellite telecommunications, remote sensing and Earth observation, global space security, Global Navigation Satellite Systems (GPS and others)).⁹⁸ However, the study does not address a structural change in the entire system of global space governance, which is the focus of this paper and, as this paper argues, where the key problem (and opportunity for change) lies.

“A crisis is a terrible thing to waste” said Nobel Laureate, Paul Romer (economic sciences, 2018).⁹⁹ The crisis that space governance is experiencing led to a study in search of innovative governance models,¹⁰⁰ the core results of which are

94. See *Montréal Declaration 2014: The Montreal Declaration on Global Space Governance*, MCGILL, <https://perma.cc/9EU6-XC5U> (last visited Nov. 8, 2021) (exhibiting the text of the declaration adopted at the second Manfred Lachs International Conference on Global Space Governance, held at McGill University, in Montreal, Canada, May 31, 2014).

95. *Id.*

96. GLOBAL SPACE GOVERNANCE: AN INTERNATIONAL STUDY (Ram S. Jakhu & Joseph N. Pelton eds., 2017) [hereinafter GLOBAL SPACE GOVERNANCE]. The author of this paper took part in the study as core drafter and reviewer.

97. *Impact of the Global Space Governance Study*, MCGILL INST. AIR & SPACE L., <https://perma.cc/4KQ8-7YQ9> (last visited Nov. 7, 2021).

98. *Id.* at xxi–xxxiii.

99. Jack Rosenthal, A Terrible Thing to Waste, N.Y. Times (July 31, 2009), <https://perma.cc/Z4NJ-DTUI>.

100. See also EYTAN TEPPER, *Global Space Governance: The Crisis and the Search for Innovative Governance Models*, in AVIATION AND SPACE LAW AND TECHNOLOGY 172–83 (Elzbieta Dynia & Lidia Brodowski eds., 2017) (discussing the need “to search for innovative governance models”).

presented in this paper.¹⁰¹ The Montréal Declaration asserted that “the time has come to . . . propose an appropriate global space governance system” and this paper does just that.¹⁰²

The underlying causes of the current crisis in global space governance are not limited to this area, and therefore neither are the observations and suggestions of this paper. Across various issue-areas of global governance the problem is the same: centralized systems of global governance fail to produce adequate results or even any at all. For instance, all attempts in the UNGA to make Antarctica a U.N. responsibility have failed.¹⁰³ Yet another attempt at centralized governance has failed. The results of the study presented herein may therefore be useful to other issue-areas in global affairs.

E. *Progress through Decentralization: The Current State of Space Governance*

Over the years, many space-related forums have emerged, in addition to UN-COPUOS. These include: multilateral and regional forums - UN-SPIDER,¹⁰⁴ UNRCSSTE,¹⁰⁵ GEO,¹⁰⁶ IDAC,¹⁰⁷ ICG,¹⁰⁸ and APSCO,¹⁰⁹ NGOs such as the Secure

101. See also Eytan Tepper, *The Big Bang of Space Governance: Towards Decentralized Regulation of Space Activities* (Dec. 2019) [hereinafter Tepper, *Big Bang*] (unpublished Doctor of Civil Law thesis), <https://perma.cc/PF5K-K8DM>.

102. *Montréal Declaration*, *supra* note 94.

103. ANTHONY AUST, *HANDBOOK OF INTERNATIONAL LAW* 355 (2nd ed. 2010).

104. U.N. Office for Outer Space Affairs UN-SPIDER Knowledge Portal, About Us, <https://perma.cc/K6YW-UNAH> (last visited Nov. 8, 2021).

105. See G.A. Res. 45/72, *International Co-operation in the Peaceful Uses of Outer Space* (Dec. 11, 1990) (noting “the United Nations should lead . . . an international effort to establish regional Centres for Space Science and Technology Education in existing national/regional educational institutions in the developing countries”).

106. *About Us*, GROUP ON EARTH OBSERVATIONS, <https://perma.cc/H8GP-HREA> (last visited Nov. 9, 2021).

107. *What's IADC*, INTER-AGENCY SPACE DEBRIS COORDINATION COMMITTEE, <https://perma.cc/7UZK-LLRZ> (last visited Nov. 9, 2021).

108. U.N. Office for Outer Space Affairs, *The International Committee on Global Navigation Satellite Systems (ICG)*, <https://perma.cc/YH3M-HS5M> (last visited Nov. 9, 2021).

109. *About Us*, ASIA-PACIFIC SPACE COOPERATION ORG. (APSCO), <https://perma.cc/KV3T-H64G> (last visited Nov. 9, 2021).

World Foundation¹¹⁰ and the International Association for the Advancement of Space Safety (IAASS);¹¹¹ the institutes of (air and) space law in several universities across the world (Cologne, McGill, Leiden, Beijing Institute of Technology, Harbin Institute of Technology), the European Space Policy Institute (ESPI),¹¹² and the European Centre for Space Law (ECSL).¹¹³ The space community in general, and the space policy and law community in particular, is an epistemic community—“a network of professionals with recognized expertise and authoritative claims to policy-relevant knowledge in a particular issue area”¹¹⁴ which, like many epistemic communities, is international in its membership.¹¹⁵ Not all of these forums are decision-making centers, but they each influence space governance to a certain extent.¹¹⁶

The above is not a comprehensive taxonomy of space-related forums, but it is sufficient to demonstrate the variety of space governance centers. While UN-COPUOS is the most important forum, there is no hierarchy between the various governance centers. Nevertheless, they are not at par with each other. The various governance centers are neither of equal legal status nor of equal power or influence. They diverge from formal institutions to voluntary groupings and epistemic com-

110. *About Us*, SECURE WORLD FOUNDATION, <https://perma.cc/W8YW-ZF4A> (last visited Nov. 9, 2021).

111. *Welcome to IAASS*, INT'L ASS'N FOR ADVANCEMENT OF SPACE SAFETY, <https://perma.cc/6H3F-XGFM> (last visited Nov. 9, 2021).

112. *Who We Are*, EUR. SPACE POL. INST., <https://perma.cc/KL3T-CQ9X> (last visited Nov. 9, 2021).

113. ESA Facts, EUR. SPACE AGENCY, <https://perma.cc/F2NX-UTU2> (last visited Nov. 9, 2021).

114. Anne L. Clunan, *Epistemic Community*, ENCYCLOPEDIA BRITANNICA, <https://perma.cc/5V6P-AU9T> (last visited Nov. 10, 2021).

115. See John Gerard Ruggie, *International Responses to Technology: Concepts and Trends*, 29 INT'L ORG. 557, 570 (1975) (noting the different kinds of epistemic communities on the international level); see also Mai'a K. Davis Cross, *Rethinking Epistemic Communities Twenty Years Later*, 39 REV. INT'L STUD. 137, 137 (2013) (noting “[e]pistemic communities are at the forefront of recognized trends towards transnational governance, and they are a major means by which knowledge translates into power”); Peter M. Haas, *Introduction: Epistemic Communities and International Policy Coordination*, 46 INT'L ORG. 1 (1992) [hereinafter Haas, *Introduction*] (examining epistemic communities in the international policy context).

116. See generally, GLOBAL SPACE GOVERNANCE, *supra* note 96, at 15–58 (providing a further review of the actors in space governance).

munities, and they diverge in the degree of their influence on actors' behavior. In other words, instead of hierarchy there is heterarchy, where no one governance center dominates the rest, and authority is distributed, bringing about a flexible network of interdependent and interacting governance centers.¹¹⁷ Space governance, as presented herein, is dispersed to numerous, independent or semi-independent governance centers operating in heterarchy.

With the cessation of the rulemaking capability of UN-COPUOS, the twenty-first century has seen a gradual, yet steady emergence of smaller, issue-specific forums, often led by experts and stakeholders, that introduce various types of instruments: 'guidelines,' 'building blocks,' 'manual,' etc. As partial and scattered as they are, they update and spread the coverage of space governance. The following sections review several sub-issues and various efforts outside UN-COPUOS to regulate them, with varying degrees of success.

The first issue-area of note is the allocation of slots in orbit around Earth and of radio frequencies. Radio frequencies are used for various purposes on Earth as well as to communicate with, and command satellites.¹¹⁸ This is an issue of critical importance, as the lack of a comprehensive, detailed system, that is followed by all actors, will lead to disruptions in communication and the placement of satellites. Perhaps this is the reason why this issue has the best governance system of all space issues, with a powerful intergovernmental institution, the International Telecommunication Union (ITU)¹¹⁹ and a multilateral, legally binding, comprehensive and elaborate treaty system, at the top of which is the Constitution and Convention of the ITU.¹²⁰ Practically all States are members of the

117. See Satoshi Miura, *Heterarchy*, ENCYCLOPEDIA BRITANNICA, <https://perma.cc/YM6U-VDEH> (last visited Nov. 9, 2021) (noting a heterarchy is a "form of management or rule in which any unit can govern or be governed by others, depending on circumstances, and, hence, no one unit dominates the rest").

118. See generally, Catherine Manning, *What Are Radio Waves?*, NASA (Aug. 31, 2018), https://www.nasa.gov/directorates/heo/scan/communications/outreach/funfacts/what_are_radio_waves (explaining what radio waves are and how they are used to communicate).

119. *About International Telecommunication Union (ITU)*, ITU, <https://perma.cc/6TVN-K54K> (last visited Nov. 10, 2021).

120. See Constitution and Convention of the International Telecommunication Union art. 1, Dec. 12, 1992, 1825, 1826 U.N.T.S. 330 (noting the pur-

ITU, parties to the treaty systems and follow the rules it provides.¹²¹ Industry representatives also participate in various ITU meetings and decision-making processes.¹²² It is, indeed, the best regulated issue-area in space activities and an excellent example of a well-functioning issue-area-specific governance center.

In contrast, the governance of natural space resources demonstrates a weak system of regulation and forums. The extraction and exploitation of natural space resources, i.e., by mining near-Earth asteroids for titanium or the Moon for water and helium 3, has little multilateral regulation. The OST is vague about such operations, no rule was subsequently agreed upon, and even the right to mine is contested.¹²³ OST Article I provides that “[o]uter space, including the moon and other celestial bodies, shall be free for exploration and use . . .”, and therefore arguably allows mining as “use” of celestial bodies. However, the (intentionally) vague wording left room for debate which started almost immediately after the adoption of the OST. After thirty years of debates, the UNGA adopted a declaration in 1996¹²⁴ that seemingly elaborated on the OST provisions, but ultimately did not decide nor end the

pose of the ITU is to “promote, at the international level, the adoption of a broader approach to the issues of telecommunications in the global information economy and society”).

121. See *Member States*, ITU, <https://perma.cc/E2HG-M8CV> (last visited Nov. 10, 2021) (noting “193 Member States work together, upholding a long-established tradition of consensus, to advance the development of information and communication technology across the world”).

122. *List of Sector Members*, ITU, <https://perma.cc/7D2T-UVW2> (last visited Nov. 10, 2021).

123. See RAM S. JAKHU, JOSEPH N. PELTON & YAW O.M. NYAMPONG, *SPACE MINING AND ITS REGULATION* 3, 4, 8, 118, 119, 123, 124, 147 (2017) (noting the potential for mining activities in outer space and that current treaties are inadequate to regulate these potential activities); RICKY J. LEE, *LAW AND REGULATION OF COMMERCIAL MINING OF MINERALS IN OUTER SPACE I* (2012) (highlighting “the absence of an appropriate regime in the existing body of international law for the commercial exploitation of mineral resources from celestial bodies”); PHILIP DE MAN, *EXCLUSIVE USE IN AN INCLUSIVE ENVIRONMENT: THE MEANING OF THE NON-APPROPRIATION PRINCIPLE FOR SPACE RESOURCE EXPLOITATION* 3 (2016) (noting current treaties “fail to distinguish between celestial bodies and the outer space in which they move”).

124. Benefits Declaration, *supra* note 77.

debate.¹²⁵ The less regulation, the more legal literature there is on the subject.¹²⁶ The Leiden Institute of Air and Space Law is leading an independent research group, with membership spanning academics, government and the relevant industry, that has developed voluntary “building blocks” for the governance of natural space resources.¹²⁷ While the multilateral framework for the governance of natural space resources is weak and hardly existent, national action and legislation is occupying an important role. The United States, Luxembourg, and the UAE have launched space mining projects. In 2015, the United States adopted a law recognizing the right of U.S. citizens (and companies) to mine natural space resources and their right over the natural space resources they extract.¹²⁸ Luxembourg has introduced a national law that follows the U.S. model,¹²⁹ and the UAE intends to do the same.¹³⁰ It is likely that other States that may eventually seek to mine natural space resources will too adopt this model as it provides incentives and rewards for those who mine the resources, but does not include the distribution of those benefits with the States that do not pursue mining. If, indeed, more States follow this model, it may lead to the consolidation of a norm. The sub-issue-area of space natural resources is a governance

125. See Elena Carpanelli & Brendan Cohen, *A Legal Assessment of the 1996 Declaration on Space Benefits on the Occasion of Its Fifteenth Anniversary*, 38 J. SPACE L. 1, 29, 30 (2012) (noting how the Declaration interprets some elements of the OST, but ultimately fails to give a clear indication as to what some of the OST’s terms mean).

126. See e.g., sources cited *supra* note 123; see also Tepper, *Structuring the Discourse*, *supra* note 3, (noting the economic and legal literature, especially in the area of property, that exists addressing unregulated resources found in a commons).

127. See Int’l Ins. of Air and Space L., *The Hague International Space Resources Governance Working Group*, LEIDEN U., <https://perma.cc/3TPH-9EAW> (last visited Nov. 10, 2021) (noting the members of the working group that developed the building blocks); see also THE HAGUE INT’L SPACE RES. GOVERNANCE WORKING GRP., BUILDING BLOCKS FOR THE DEVELOPMENT OF AN INTERNATIONAL FRAMEWORK ON SPACE RESOURCE ACTIVITIES 1 (2019) (noting that the “international framework should create an enabling environment for space resource activities that takes into account all interests”).

128. U.S. Commercial Space Launch Competitiveness Act, *supra* note 86.

129. LOI DU 20 JUILLET 2017 SUR L’EXPLORATION ET L’UTILISATION DES RESSOURCES DE L’ESPACE, *supra* note 87.

130. Jinyuan Su, *Legality of Unilateral Exploitation of Space Resources under International Law*, 66 INT’L & COMP. L.Q. 991, 992 (2017).

center in evolution. An epistemic community is emerging with professionals who create and accumulate knowledge on the issue in various disciplines, e.g., engineering, economics, legal studies, and policy studies. A forum was established, and additional forums may soon evolve, e.g., a forum for industry standards. With time, and in the aggregate, the governance of natural space resources will evolve to become more comprehensive and updated.

Between both extremes of governance centers, there are other sub-issue-areas which arguably have their own semi-developed governance centers. The issue of military uses of outer space has multiple, partial, and scattered regulation and *fora*. Article III of the OST applied international law to the activities of States in outer space, i.e., public international law's "laws of war."¹³¹ The 1963 Partial Test Ban Treaty (PTBT) provides for a ban on nuclear weapons tests in outer space,¹³² and the 1977 Environmental Modification Convention (ENMOD) prohibits the "hostile use of environmental modification techniques having widespread, long-lasting or severe effects" on the environment, specifically applying to the environment of outer space.¹³³ In terms of *fora*, the United Nations' First Committee and Security Council, the CD, UNIDIR and UNODA all have mandates on this issue.¹³⁴ Space specific provisions are included in the OST, Article IV of which prohibits the placement of weapons of mass destruction in orbit around Earth and the establishment of military bases on celestial bodies.¹³⁵ Yet, "[t]he principles of space law and current proposals to

131. Outer Space Treaty, *supra* note 1, art. 3.

132. Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water art. 1, Aug. 5, 1963, 14 U.S.T. 1313, 480 U.N.T.S. 43.

133. Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques art. 1, May 18, 1977, 31 U.S.T. 333, 1108 U.N.T.S. 152.

134. E.g., U.N. Institute for Disarmament Research, For a More Stable and Secure World, <https://perma.cc/5JA5-8FW6> (last visited Nov. 10, 2021); U.N. Office for Disarmament Affairs, About Us, <https://perma.cc/LZ2E-GP3N> (last visited Nov. 10, 2021); U.N. Office for Disarmament Affairs, Conference on Disarmament, <https://perma.cc/5EHU-4JBD> (last visited Nov. 10, 2021); U.N. Office for Disarmament Affairs, Disarmament in the General Assembly, <https://perma.cc/4AFV-53RE> (last visited Nov. 10, 2021); U.N. Office for Disarmament Affairs, Disarmament in the Security Council, <https://perma.cc/6A4U-8VHJ> (last visited Nov. 10, 2021).

135. Outer Space Treaty, *supra* note 1, art. 4.

address the challenges of space security do not currently provide an effective normative framework to address the initiation and possible conduct of hostilities.”¹³⁶ There is an ongoing international project to identify all the rules of international law applicable to military uses of outer space, and organize them in a single manual (MILAMOS).¹³⁷ Additionally, an epistemic community in this area is already vibrant.

The issue of space debris is arguably already an established governance center. The Inter-Agency Space Debris Coordination Committee established, in 1993, non-legally binding ‘guidelines’: the Space Debris Mitigation Guidelines.¹³⁸ These were adopted by UN-COPUOS in 2007. Here the forum has no universal participation, and instead it is led by the major users or stakeholders. However, as noted before, the quantity of space debris has sky-rocketed after the adoption of the guidelines,¹³⁹ thus questioning the effectiveness of this governance center to date.

Financing is another issue with growing importance, considering the rapid increase of the commercial space sector. The need to finance mobile equipment such as aircrafts, trains, and spacecrafts, including satellites, meets a difficulty to register a lien on them, given their mobility across borders, and in the case of space assets, also beyond any national jurisdiction. UNIDROIT developed the Cape Town Convention on International Interests in Mobile Equipment and later four

136. GLOBAL SPACE GOVERNANCE, *supra* note 96, at 298.

137. *What is the MILAMOS Project?*, MCGILL, <https://perma.cc/H66F-TAAV> (last visited Nov. 10, 2021). The manual will not introduce new rules but rather identify existing rules in various treaties and other legal instruments. *Id.* See also *The Woomera Manual*, U. ADELAIDE, <https://perma.cc/C9QW-5ESF> (last visited Nov. 11, 2021) (describing an international research project to “develop a Manual that objectively articulates and clarifies existing international law applicable to military space operations”).

138. Inter-Agency Space Debris Coordination Committee (IADC), UNION INT’L ASS’N, <https://perma.cc/K5TS-8ZT8>, (last visited Nov. 10, 2021) (noting the IADC was founded in 1993); see also INTER-AGENCY SPACE DEBRIS COORDINATION COMM., IADC SPACE DEBRIS MITIGATION GUIDELINES (rev. 2, 2020) (noting the revision history of the guidelines and that “[o]rganisations are encouraged to use these Guidelines”).

139. *About Space Debris*, EUR. SPACE AGENCY, <https://perma.cc/73R6-FFMT> (last visited Nov. 10, 2021).

protocols that address specific types of equipment, one of them is the space assets protocol.¹⁴⁰

Finally, there is the issue of space traffic control, i.e., preventing collisions between space crafts and between a spacecraft and space debris. It is an issue of growing importance,¹⁴¹ and an emerging, if not an established, governance center. The need for space traffic control was demonstrated by the 2009 collision between a commercial U.S. satellite and a Russian deactivated satellite¹⁴² and the 2013 collision of Ecuador's first satellite with space debris.¹⁴³ There are discussions on whether the International Civil Aviation Organization (ICAO) should have mandate on the issue, and the ICAO has already started working in this direction.¹⁴⁴ However, it is the United States that leads the efforts of avoiding collision with space debris. The United States manages a space situational awareness (SSA) system that tracks all objects larger than a softball and alerts all actors in space for possible collisions.¹⁴⁵ The issue of space traffic control demonstrates that a single user can dominate a governance center, or part thereof. In this case, the U.S. dominance stems from the fact that it is the sole provider of SSA information.¹⁴⁶ The United States is gathering and disseminating the information and therefore determines the standards for SSA.¹⁴⁷ The European Space Agency (ESA) is working on its own SSA system, and when it becomes

140. Cape Town Convention, *supra* note 80; Space Assets Protocol, *supra* note 80.

141. *See generally* STUART EVES, SPACE TRAFFIC CONTROL (2017) (discussing the growing need for space traffic control and recommending approaches).

142. *See* BRIAN WEEDEN, SECURE WORLD FOUND., 2009 IRIDIUM-COSMOS COLLISION FACT SHEET 1–3 (2010) (describing how the two objects collided and noting the legal uncertainties related to the event).

143. *See* Ronnie Nader & T.S. Kelso, *The Pegasus Incident: The Loss of the First Ecuadorian Satellite and Its Recovery*, 65 INT'L ASTRONAUTICAL CONG.: SPACE DEBRIS SYMP. (2014) (noting the loss of the satellite's signal after a close approach with an object).

144. ICAO, ICAO Space Programme, <https://perma.cc/U3FB-DMTQ> (last visited Nov. 12, 2021) (noting how civil spaceflight presents “operational issues and regulatory hurdles” and how “ICAO has been addressing [similar issues] in the air transport domain since its inception 70 years ago”).

145. *What is SSA?*, SPACEVIEW, <https://perma.cc/V62T-AAX3> (last visited Nov. 12, 2021).

146. TIFFANY CHOW, SECURE WORLD FOUND., SPACE SITUATIONAL AWARENESS SHARING PROGRAM: AN SWF ISSUE BRIEF 7 (2011).

147. *Id.* at 4–6.

functional, it might require change in the governance structure.¹⁴⁸ In June 2018, the U.S. President signed Space Policy Directive-3, adopting a National Space Traffic Management Policy (“National STM Policy,” 2018), that will determine the character of space traffic control at least as much, if not more, than any multilateral forum and instrument.¹⁴⁹

Thus, the initial monocentric, hierarchic structure of space governance is experiencing a slow-motion big bang, by which the basic, early building blocks remain, but subsequent expansion and evolution of space governance is decentralized through the work of various governance centers, with various participants introducing various outputs in distinct sub-issue-areas. Considering this inevitable decentralization, we can expect the continuation, and possible acceleration of, the emergence of issue-specific governance centers and new regimes. This bottom-up evolution of a polycentric governance system is a kind of ‘spontaneous order’, the emergence of order as a result of the voluntary activities of individual actors with no single guiding hand.¹⁵⁰ Nevertheless, UN-COPUOS is still the most important forum, and the UNOOSA the most important agency. UNOOSA already works and assists all actors in space governance and therefore serves in practice as coordinator, bringing the accumulated knowledge and practices to each new actor.

F. *An emerging Artemis bloc?*

The Artemis Accords also deserve separate reference, and, considering they were recently introduced, they should

148. *Id.* at 10–12.

149. Todd Harrison & Kaitlyn Johnson, *Space Policy Directive-3, National Space Traffic Management Policy*, CTR. FOR STRATEGIC & INT’L STUD. (June 19, 2018), <https://perma.cc/V6PZ-JCDS> (noting the “new directive shifts responsibility for providing space situational awareness (SSA) data to satellite operators from the [U.S.] Department of Defense”).

150. See F. A. Hayek, *The Use of Knowledge in Society*, 35 AM. ECON. REV. 519, 519–20 (1945) (explaining an order in which “the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form, but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess”). See generally ADAM SMITH, AN INQUIRY INTO THE NATURE AND CAUSES OF THE WEALTH OF NATIONS (1776) (introducing the concept of the invisible hand).

be revisited when evidence of their implementation is available.

The Artemis Program is a NASA-led program, with international partners, aimed at establishing a long-term, self-sustainable habitat on the Moon, and later on Mars.¹⁵¹ In 2020, the United States launched an initiative for a legal framework for the Artemis Program: the Artemis Accords.¹⁵² Countries wishing to be part of the Artemis Program were required to join the Artemis Accords. On October 13, 2020, eight countries signed the Accords: the United States, Australia, Canada, Italy, Japan, Luxembourg, the UAE, and United Kingdom.¹⁵³ Israel signed the Artemis Accords in January 2022,¹⁵⁴ while France and Germany are still contemplating whether to sign.¹⁵⁵

The Accords reaffirm commitment to the 1967 Outer Space Treaty and much of its provisions follow accepted principles of peaceful purposes, transparency, and commitment to scientific and technological cooperation and interoperability.¹⁵⁶ However, the provision of the Accords relating to the exploitation of space resources raised objections, as part of a long-standing debate on the issue.¹⁵⁷ There is also a more

151. NASA *Outlines Lunar Surface Sustainability Concept*, NASA (Apr. 2, 2020), <https://www.nasa.gov/feature/nasa-outlines-lunar-surface-sustainability-concept>.

152. NASA, *International Partners Advance Cooperation with First Signings of Artemis Accords*, NASA (Oct. 13, 2020), <https://www.nasa.gov/press-release/nasa-international-partners-advance-cooperation-with-first-signings-of-artemis-accords>.

153. *Id.*

154. *Israel Signs Artemis Accords*, NASA (Jan. 27, 2022), <https://www.nasa.gov/israel-signs-artemis-accords>.

155. Tom Howell Jr., *Harris: France Wants to Join the Artemis Accords, a Major Space-exploration Pact*, WASH. TIMES (Nov. 11, 2021), <https://perma.cc/RP7T-5VQA>; Joshua Posaner & Giorgio Leali, *America's New Moonshot: Getting Europe to Sign Up to its Space Rules*, POLITICO (Jan. 29, 2022), <https://perma.cc/GJC7-DFSR>.

156. NASA, THE ARTEMIS ACCORDS: PRINCIPLES FOR COOPERATION IN THE CIVIL EXPLORATION AND USE OF THE MOON, MARS, COMETS, AND ASTEROIDS FOR PEACEFUL PURPOSES pmbl., § 1 (2020).

157. *See id.* § 10 (emphasizing that “the extraction and utilization of space resources, including any recovery from the surface or subsurface of the Moon, Mars, comets, or asteroids, should be executed in a manner that complies with the Outer Space Treaty and in support of safe and sustainable space activities”).

general opposition to the Accords among countries and scholars, who see the Accords as an attempt to create a U.S.-centered legal regime.¹⁵⁸

It is yet to be seen how the Artemis Accords will evolve and influence space governance. Considering the Accords are backed by the largest space agency that leads the Artemis Program, these Accords may very well become the foundations for the governance of long-term human space habitat for generations to come, effectively writing the new ‘social contract’ that will apply in space.

Overall, the Artemis Accords try to walk a fine line between remaining within the established multilateral rules and framework—mainly the OST—and promoting the U.S. interpretation of the treaty regarding the key issues of the utilization of space resources, and safety zones. This interpretation may gain wider acceptance as other States, interested in the exploitation of space resources, would value the permissive interpretation that does not require international licensing or profit sharing.

The Accords sets general principles.¹⁵⁹ They provide a framework that will require further negotiations on more detailed arrangements. The pronounced purpose of the Accords

158. See, e.g., Aaron Boley & Michael Byers, *U.S. Policy Puts the Safe Development of Space at Risk*, 370 *SCIENCE* 174 (2020) (arguing the United States “is overlooking best practice with regard to the sustainable development of space” and that “[i]nstead of pressing ahead unilaterally and bilaterally, the United States should support negotiations on space mining within the UN Committee on the Peaceful Uses of Outer Space”); Editorial Bd., *We Should Aim for the Moon, Not Claim It*, *FIN. TIMES* (May 8, 2020), <https://perma.cc/2BKB-BPPU> (arguing the Artemis Accords are concerning because “they appear to be a further sign of the Trump administration’s disdain for the multilateral process”); Alexander Stirn, *Do NASA’s Lunar Exploration Rules Violate Space Law?*, *SCI. AM.* (Nov. 12, 2020), <https://perma.cc/59XW-LWC9> (asking whether the Artemis Accords violate international law); Guoyu Wang, *NASA’s Artemis Accords: the Path to a United Space Law or a Divided One?*, *SPACE REV.* (Aug. 24, 2020), <https://perma.cc/LUC3-J9LN> (noting that “the Accords intend to create a favorable international environment for space resources exploitation and utilization led by the United States” and that they “follow the American approach of space global governance[of] ‘shaping international space rules and politics on basis of national law and policies, characterized as a public-private partnership’”).

159. See NASA, *supra* note 156, pmb1. (committing the signatories to various principles).

is “to establish a common vision via a practical set of principles, guidelines, and best practices to enhance the governance of the civil exploration and use of outer space with the intention of advancing the Artemis Program.”¹⁶⁰ Significantly, the Artemis Accords were prepared, negotiated, and adopted outside of UN-COPUOS and *outside a multilateral context*. Further, the future elaboration of the principles of these Accords may also be U.S.-led, and certainly not a multilateral effort. These Accords demonstrate the emergence of forums and instruments that fall outside the traditional monocentric framework. They also demonstrate that such alternative forums can be very powerful in shaping future space exploration and governance. The Artemis Accords have the potential to create an ecosystem of space governance that will apply and be recognized by a select group of States. One could call it the Artemis bloc.

The plethora of instruments reviewed above expands and updates the governance of each sub-issue and space governance as a whole.

IV. DECENTRALIZATION IN GLOBAL GOVERNANCE

The basic condition in world politics is the absence of a global government or supreme authority—what the international relations (IR) literature refers to as “anarchy.” Moreover, to a large extent, this state of anarchy defines the study of international relations.¹⁶¹ Absent a world government, the process, which is global governance, is led by the various and numerous actors in global affairs, who *themselves*, through international cooperation, establish and maintain the norms, principles, rules, policies, institutions, and other fora that all influence the behavior of the actors in global affairs. This basic condition of “governance without government”¹⁶² means that

160. *Id.* § 1.

161. See generally Silviya Lechner, *Why Anarchy Still Matters for International Relations: On Theories and Things*, 13 J. INT’L POL. THEORY 341 (2017); Helen Milner, *The Assumption of Anarchy in International Relations Theory: A Critique*, 17 REV. INT’L STUD. 67 (1991); Silviya Lechner, *Anarchy in International Relations*, OXFORD RES. ENCYCLOPEDIAS: INT’L STUD. (Nov. 20, 2017), <https://perma.cc/2AAC-5DRN>.

162. See Rosenau, *supra* note 47, at 13 (explaining that in previous centuries “the prevailing order was sustained by highly decentralized arrangements for moving through time”).

global governance—as well as the governance of specific issue-areas in global affairs, such as space activities, is decentralized.

Decentralized governance is a structural phenomenon and it is studied by three different, albeit neighboring disciplines. Each discipline uses a different term, but there are overwhelming similarities in the description of the phenomenon and insights thereupon.

International law scholars point to the proliferation of treaties, rules, international institutions and international tribunals and call it, often with concern, “fragmentation.”¹⁶³ Some international law scholars discuss fragmentation using IR’s concept of “regimes.”¹⁶⁴ Recent IR literature discusses “regime complexes.” A regime complex means that a single issue-area has no integrated, comprehensive governing regime. Instead, there are multiple and partly overlapping legal instruments and fora, in other words – fragmentation. Political scientists, and in particular institutional analysis scholars, may talk about ‘polycentrism’ to describe multiple independent decision-making centers (‘governance centers’) with overlapping jurisdictions. Polycentrism resembles a case of a regime complex where there is no single, centralized governing institution of forum but rather several governing institutions or fora with overlapping jurisdictions. The following three sections describe each phenomenon—fragmentation, regime complexes and polycentrism—and their almost unexpected merits. The section thereafter presents a convergence of insights from the study of these three phenomena, leading to the paper’s call for the embrace of polycentric governance.

163. See Margaret A. Young, *Fragmentation*, OXFORD BIBLIOGRAPHIES (July 30, 2014) [hereinafter Young, *Fragmentation*], <https://perma.cc/CY8U-DXZP> (noting the fragmentation of international law “has been the subject of much scholarly attention over the last decade”).

164. See, e.g., Steven R. Ratner, *Regulatory Takings in Institutional Context: Beyond the Fear of Fragmented International Law*, 102 AM. J. INT’L L. 475, 476 (2008) (explaining that the diversity of the “regimes and institutions will suggest in turn that much of the feared fragmentation in international law is an inevitable and indeed welcome development”); see also David Kennedy, *One, Two, Three, Many Legal Orders: Legal Pluralism and the Cosmopolitan Dream*, 31 N.Y.U. REV. L. & SOC. CHANGE 641, 658 (2007) (explaining how the human rights field is made up of “particular people, regimes, and institutions [that] contest what will be spoken, legitimated, and denounced”).

A. Fragmentation

Fragmentation of international law involves both substantive and institutional fragmentation. Substantive fragmentation is the proliferation of treaties and conventions—multilateral, regional, and bilateral—with partial overlap in scope and occasional conflicting, but equally authoritative rules. Institutional fragmentation is the proliferation of international fora, courts and tribunals, with partial overlap in jurisdiction.¹⁶⁵ Institutional fragmentation increases substantive fragmentation as even a single treaty provision might be, and sometimes is, interpreted differently by various tribunals.¹⁶⁶ A related issue is the proliferation of special or self-contained regimes. A self-contained regime is a regime in a specific issue-area in global affairs (e.g., human rights, trade law or space activities), with its own principles, rules, fora and even diplomatic expertise and academic specialization.

International law scholars raised concern over the phenomenon of fragmentation¹⁶⁷ and self-contained regimes,¹⁶⁸

165. *See, e.g.*, YUVAL SHANY, *THE COMPETING JURISDICTIONS OF INTERNATIONAL COURTS AND TRIBUNALS* 7–10 (2003) (explaining the fragmentation of international courts and tribunals without a central legislative organ).

166. *Id.* at 8, 9 (noting the overlapping jurisdictions of international courts and tribunals).

167. *E.g.*, Martti Koskenniemi & P. . iivi Leino, *Fragmentation of International Law? Postmodern Anxieties*, 15 *LEIDEN J. INT'L L.* 553, 554 (2002) (noting how serious uncertainty might result from fragmentation of international law).

168. The concern is that the regime develops to such an extent that it effectively displaces general international law. *See, e.g.*, Young, *Fragmentation*, *supra* note 163 (discussing special regimes that are concerned with a particular subject matter); JAMES CRAWFORD, *CHANCE, ORDER, CHANGE: THE COURSE OF INTERNATIONAL LAW* 275–309 (2014) (defining a self-contained regime as one where “a particular substantive or institutional field of international law develops to such an extent that it effectively displaces the general law”); Bruno Simma & Durk Pulkowski, *Leges Speciales and Self-Contained Regimes*, in *THE LAW OF INTERNATIONAL RESPONSIBILITY* 139, 140 (James Crawford, Alain Pellet & Simon Olleson eds., 2010) (noting that self-contained regimes in State responsibility are not desirable); Martti Koskenniemi, *The Politics of International Law – 20 Years Later*, 20 *EUR. J. INT'L L.* 7, 9 (2009) (pointing out that “the world of legal practice is being sliced up in institutional projects that cater for special audiences with special interests and special ethos”); Bruno Simma, *Self-contained Regimes*, 16 *NETH. Y.B. INT'L. L.* 111 (1985) (discussing approaches to diplomatic immunities at the International Court of Justice, the European Economic Community, and human rights treaties as examples of self-contained regimes); Bruno Simma & Durk Pulkowski, *Of*

which led the International Law Commission to establish a special Study Group, chaired by Koskenniemi, that submitted a detailed report in 2006.¹⁶⁹ The fragmentation of international law is due, in large part, to the structure of this legal system. Like global governance, the system of international law is decentralized, lacking a lawmaker and a powerful executive branch/authority. International law, as Fischer-Lescano and Teubner note, cannot be unified or hierarchized,¹⁷⁰ and, as Crawford puts it: “fragmentation is the product of a system of laws that, by and large, lacks a sense of vertical integration, of hierarchy.”¹⁷¹ Recent writings assert that there is some convergence,¹⁷² but fragmentation, just like decentralization, is a per-

Planets and the Universe: Self-Contained Regimes in International Law, 17 EUR. J. INT'L L. 483 (2006) (analyzing diplomatic law, European Community law, the WTO, and human rights as examples of self-contained regimes). See generally MULTI-SOURCED EQUIVALENT NORMS IN INTERNATIONAL LAW (Tomer Broude & Yuval Shany eds., 2011); REGIME INTERACTION IN INTERNATIONAL LAW: FACING FRAGMENTATION (Margaret A. Young ed., 2012) [hereinafter REGIME INTERACTION].

169. Fragmentation of International Law, *supra* note 13. See also Int'l Law Comm'n, Rep. on the Work of Its Fifty-Second Session, U.N. Doc. A/55/10, at 143–50 (detailing an analysis of the risks ensuing from fragmentation of international law by Gerhard Hafner that led to the formation of the Study Group); Martti Koskenniemi, *The Fate of Public International Law: Between Technique and Politics*, 70 MOD. L. REV. 1, 17 (2007) (noting how the U.N. General Assembly requested the International Law Commission address the problem of fragmentation).

170. Andreas Fischer-Lescano & Gunther Teubner, *Regime-Collisions: The Vain Search for Legal Unity in the Fragmentation of Global Law*, 25 MICH. J. INT'L L. 999, 1004 (2004). See also Tomer Broude, *Fragmentation(s) of International Law: On Normative Integration as Authority Allocation*, in THE SHIFTING ALLOCATION OF AUTHORITY IN INTERNATIONAL LAW 99 (Tomer Broude & Yuval Shany eds., 2008) (noting the difficulties of addressing the problem of fragmentation and the importance of the Study Group Report).

171. CRAWFORD, *supra* note 168, at 283.

172. Mads Andenas & Eirik Bjorge, *Introduction: From Fragmentation to Convergence in International Law*, in A FAREWELL TO FRAGMENTATION: REASSERTION AND CONVERGENCE IN INTERNATIONAL LAW 1–34 (Mads Andenas & Eirik Bjørge eds., 2015). Andenas and Bjorge and the other contributors to the volume they edited argue that international law now sees more convergence and unity than fragmentation, inter alia as the result of the work of the International Court of Justice (ICJ) and most other international tribunals and UN institutions, such as the International Law Commission (ILC) and special procedures of various. Nevertheless, Andenas and Bjorge admit that “[f]ragmentation of international law has not, however, come to a complete end; the end of all fragmentation is not a realistic prospect . . . fragmenta-

manent structural feature of international law and will remain as long as the international society is characterized by anarchy, and possibly even beyond.

Benvenisti and Downs assert that fragmentation is a serious problem, as it operates “to sabotage the evolution of a more democratic and egalitarian international regulatory system and to undermine” the integrity and reputation of international law.¹⁷³ Fragmentation, they both assert, is manipulated by powerful states to preserve their dominance and to allow for the opportunistic breaking of rules without seriously jeopardizing the system they have created.¹⁷⁴ Nevertheless, for the most part, initial concerns about fragmentation diminished over time. Crawford asserts that still, “the centre holds,” and that the system of international law retains the tools necessary to maintain its own coherence.¹⁷⁵ Indeed, as Broude notes, fragmentation “is no longer considered to constitute an existential threat to international law as a system. Fragmentation, to a great extent, has been normalized, or accepted, as both politically inevitable and legally manageable.”¹⁷⁶

Moreover, fragmentation may be perceived as a positive, constructive phenomenon. Koskenniemi and Leino pointed to the proliferation of international tribunals and substantive fragmentation of international law and asserted that fragmentation “is an institutional expression of political pluralism internationally” that it does not warrant excessive worries and that it may even bring positive outcomes.¹⁷⁷ Charney, in discussing the proliferation of international tribunals, asserts that notwithstanding differences, the tribunals operate within the same fundamentals and that alternative tribunals complement the work of the ICJ, and strengthen, not weaken, the system of

tion [is] a part of a dynamic legal system . . . [c]onvergence can be regarded as just as much a part of any legal system, together with fragmentation.” *Id.* at 1, 2.

173. Benvenisti & Downs, *The Empire’s New Clothes*, *supra* note 16, at 597.

174. *Id.*

175. CRAWFORD, *supra* note 168, at 308.

176. Tomer Broude, *Keep Calm and Carry On: Martti Koskenniemi and the Fragmentation of International Law*, 27 *TEMPLE INT’L & COMP. L. J.* 279, 280 (2013). However, as Broude also notes, Koskenniemi cautions that fragmentation promotes anti-formalist managerialism in international affairs, which he (Koskenniemi) views negatively. *Id.*

177. Koskenniemi & Leino, *supra* note 167, at 553.

international law.¹⁷⁸ Furthermore, he argues, the adoption of different approaches, on a single issue, by various tribunals, may be positively viewed as ‘experimentation’ that could lead to the discovery of the superior approach or rules for that issue. Fragmentation, Charney asserts, is not a problem, but a blessing.¹⁷⁹

In discussing fragmentation, it is crucial to consider the relevant background: the constraints of the system of international law. When taking that background into consideration, fragmentation emerges as more of a solution than a problem. Indeed, as Koskenniemi and Leino noted:

To read the debate about fragmentation as if it had to do only with coherence in the abstract is to be mistaken about what is actually at stake. Special regimes and new organs are parts of an attempt to advance beyond the political present that in one way or another has been revealed unsatisfactory.¹⁸⁰

Fragmentation, one may conclude, is inevitable, given the constraints of world politics, and it allows for the development and application of international law, where otherwise it would have been impossible or too difficult to do so. In a decentralized international society, a fragmented decentralized legal system is both inevitable and effective in achieving international regulation.

178. Jonathan I. Charney, *Is International Law Threatened by Multiple International Tribunals?*, in COLLECTED COURSES OF THE HAGUE ACADEMY OF INTERNATIONAL LAW 125–38 (1998) (noting the benefits of specialized international dispute settlement forums).

179. *Id.* See also Int’l Law Comm’n, *supra* note 169, 143–50 (discussing the pros and cons of fragmentation); Jonathan I. Charney, *The Impact on the International Legal System of the Growth of International Courts and Tribunals*, 31 N.Y.U. J. INT’L L. & POL. 697, 700 (1999) (noting, for example, that the “multiplicity of international tribunals” . . . “permits a degree of experimentation and exploration”); Gerhard Hafner, *Pros and Cons Ensuing from Fragmentation of International Law*, 25 MICH. J. INT’L L. 849, 850 (2004) (explaining how “fragmentation could have either positive or negative effects on the rule of law in international relations”); John H. Jackson, *Fragmentation or a Unification Among International Institutions: The World Trade Organization*, 31 N.Y.U. J. INT’L L. & POL. 823, 828 (1999) (noting how the World Trade Organization’s dispute settlement system interacts with other dispute institutions).

180. Koskenniemi & Leino, *supra* note 167, at 578.

B. *Regime Complexes*

International relations theories are instrumental to the discourse on the architecture of global governance and institutional design.¹⁸¹ Within the IR literature, the study of *international regimes*, in development since the 1970s, and initially termed “Regime Theory,” has become increasingly influential.¹⁸² It later evolved to provide the intellectual capital for the study of global governance that emerged in the 1990s.¹⁸³ The study of international regimes observes and seeks to explain how international cooperation emerges and is sustained under anarchy—the absence of a global central political authority. International cooperation, the theory suggests, stems from the interdependence of and complex interactions between the

181. See Kenneth W. Abbott, *Toward a Richer Institutionalism for International Law and Policy*, 1 J. INT’L L. & INT’L REL. 9, 11 (2005) (outlining “several intellectual tasks for which IR theory is especially helpful”).

182. See, e.g., ROBERT O. KEOHANE, *AFTER HEGEMONY: COOPERATION AND DISCORD IN THE WORLD POLITICAL ECONOMY* 65–132 (1984) [hereinafter KEOHANE, *AFTER HEGEMONY*] (presenting a functional theory of international regimes based on game theory and collective goods theory); ROBERT O. KEOHANE & JOSEPH S. NYE, *POWER AND INTERDEPENDENCE: WORLD POLITICS IN TRANSITION* 19–22 (1977) (examining the concept of interdependence and its effect on international regime change); Robert Axelrod & Robert O. Keohane, *Achieving Cooperation under Anarchy: Strategies and Institutions*, 38 WORLD POL. 226, 249–54 (1985) (explaining how international regimes can facilitate cooperation in world politics); Stephen D. Krasner, *Structural Causes and Regime Consequences: Regimes as Intervening Variables*, 36 INT’L ORG. 185, 186 (1982) (defining regimes as “sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors’ expectations converge in a given area of international relations”); Oran R. Young, *Regime Dynamics: The Rise and Fall of International Regimes*, 36 INT’L ORG. 277, 281–97 (1982) (explaining how regimes form and transform and the types of pressures that lead to that change); see also Oran R. Young, *Regime Theory Thirty Years On: Taking Stock, Moving Forward*, E-INTERNATIONAL REL. (Sept. 18, 2012), <https://perma.cc/D7H9-R6PR> (reviewing the development of regime theory generally). See generally REGIME THEORY AND INTERNATIONAL RELATIONS (Volker Rittberger & Peter Mayer eds., 1995) (examining the problems associated with analyzing regimes).

183. See COMM’N ON GLOB. GOVERNANCE, *supra* note 47, at 2–7 (noting how governance includes formal regimes that are empowered to enforce compliance); Rosenau, *supra* note 47, at 8–11 (reviewing how the study of regime theory contributes to the study of governance). Not surprisingly, some leading authors on Regime Theory became leading authors about global governance, like Robert O. Keohane, Oran Young and Michael Zürn.

self-interested actors in global affairs.¹⁸⁴ International regimes facilitate international cooperation and, at the same time and given the constraint of anarchy, international regimes are made by way of international cooperation. Regime Theory is associated with neoliberal institutionalism,¹⁸⁵ however I view it as a practical combination of realism and liberalism that explains ‘liberal’ phenomenon, international cooperation, with ‘realist’ reasoning—the self-interest of actors in global affairs.¹⁸⁶

A Regime, according to Krasner’s classic definition, is a set “of implicit or explicit principles, norms, rules, and decision-making procedures around which actors’ expectations converge in a given area of international relations.”¹⁸⁷ Nye describes regimes as “a subset of norms, which are shared expectations about appropriate behavior. Norms can be descriptive, prescriptive or both. They can also be institutionalized (or not) to varying degrees.”¹⁸⁸ Though none of the above definitions mentions *fora*, I suggest that existence of *fora* is a feature that appears in many, but not all, regimes and it plays an important part in the regimes in which it appears. A forum may create a regime and is often established by the regime, or by the same instrument that establishes the substantial rules of the regimes, in order to monitor and enhance the regime. Regimes are not an ad-hoc agreement or instance of cooperation for the promotion of short-term self-interests, and they therefore require, and often have, some kind of forum or administration.¹⁸⁹

184. KEOHANE & NYE, *supra* note 182, at 23 (comparing their concept of complex interdependence with realism and arguing it explains international relations better than realism).

185. Anu Bradford, *Regime Theory*, in MAX PLANCK ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW (2007).

186. See Benjamin Meiches & Raymond Hopkins, *Regime Theory*, in OXFORD RESEARCH ENCYCLOPEDIA: INTERNATIONAL STUDIES (2012) (suggesting that “[c]ommon approaches to regime theory include realism, neoliberalism, cognitivism, and constructivism”).

187. See also Krasner, *supra* note 182, at 186.

188. JOSEPH S. NYE, GLOB. COMM’N ON INTERNET GOVERNANCE, THE REGIME COMPLEX FOR MANAGING GLOBAL CYBER ACTIVITIES (2014), <https://perma.cc/FSR7-EHJC>.

189. See Stephan Haggard & Beth A. Simmons, *Theories of International Regimes*, 41 INT’L ORG. 491, 497 (1987) (“The regime’s benefits are simply that it provides incentives to certain forms of cooperative action . . . by offering

The case of civil aviation and ICAO may help to demonstrate this point. In 1944, the United States convened an international conference on civil aviation in Chicago, with representatives from fifty-five states. The conference resulted in the Convention on International Civil Aviation, also known as the Chicago Convention, which provided substantial rules on civil aviation. The Chicago Convention also established the International Civil Aviation Organization (ICAO), headquartered in Montréal, which monitors and enhances the regime governing international air transport i.e., by the development of Aviation Standards and Recommended Practices.¹⁹⁰ Another example is the WTO, which represents the regime governing international trade, and includes a powerful dispute resolution mechanism that enforces the rules of the regime.¹⁹¹

I therefore define regimes as implicit or explicit norms, rules, and decision-making procedures, descriptive or prescriptive in nature, that create, reflect, and affect actors' expectations and are institutionalized to varying degrees, from a 'gentlemen's agreement' and other soft law instruments through treaties and other legally binding instruments. Regimes may be created, observed, enhanced and even enforced by a multilateral forum or international organization, which constitute a part of the regime.

International regimes are the building blocks of global governance. The many international regimes establish, implement and reform much of the repertoire of norms and rules that guide the behavior of actors in global affairs. These regimes include general regimes like the U.N. system and specialized, issue-area-specific, regimes such as the regime for civil aviation. A single issue-area can have, and often does have, more than one regime, as does the issue-area of climate change,¹⁹² and the governance of a certain issue-area is there-

forums in which reputation comes into play or where games can be iterated and linked.”).

190. *History*, ICAO, <https://perma.cc/VQ5M-CJQK> (last visited Nov. 12, 2021); *What We Do*, ICAO, <https://perma.cc/E2HC-F48E> (last visited Nov. 12, 2021).

191. Jackson, *supra* note 179, at 828.

192. See Robert O. Keohane & David G. Victor, *The Regime Complex for Climate Change*, 9 PERSPECT. POLIT. 7, 8–12 (2011) (explaining how multiple constituencies interact within the regime complex for climate change).

fore the aggregate result of the various relevant regimes. Which brings us to the theory of regime complexes.

The decentralized structure of world politics projects to specific issue-areas in global affairs, in which, instead of a unified coherent regime, there is a collection of regimes which vary in scope and norms. Raustiala and Victor analyzed the implications of the proliferation and rising density of international treaties and organizations and conceptualized the phenomenon of “regime complexes.”¹⁹³ This is different from a single, discrete regime governing a single issue-area; instead the relevant rules are found in several regimes—what they call *elemental regimes*. The elemental regimes are legal agreements created and maintained in distinct fora, with participation of different sets of actors, that overlap in scope, subject, and time. The rules in these elemental regimes functionally overlap and even often conflict, and yet there is no agreed hierarchy between them, or a rule or procedure for resolving conflicts between rules. The collective of these elemental regimes is a *regime complex*: “an array of partially overlapping and nonhierarchical” regimes, possibly interconnected and often with conflicting rules, “governing a particular issue-area.”¹⁹⁴ Regime complexes have become a widespread phenomenon in various issue-areas in global affairs. Moreover, even (initially) non-complex regimes are likely to become complex. A multitude of regimes in a single issue-area means various normative frameworks and operative mechanisms that are partly overlapping, competing, and complementing. For the set of regimes to qualify as a regime complex, the regimes should be more complementary than competitive.¹⁹⁵

Regime complexes, like fragmentation, are a result of the reality of global politics. The international society is characterized by multiple actors, each with different and conflicting agendas and interests.¹⁹⁶ The combination of the inherent

193. Kal Raustiala & David Victor, *The Regime Complex for Plant Genetic Resources*, 58 INT'L ORG. 277, 279 (2004).

194. *Id.*

195. See Amandine Orsini, Jean-Frédéric Morin & Oran Young, *Regime Complexes: A Buzz, a Boom, or a Boost for Global Governance?*, 19 GLOBAL GOVERNANCE 27, 32–33, 37 (2013) (noting a later definition of the concept of regime complexes and their impact on global governance).

196. E.g., Keohane & Victor, *supra* note 192 (explaining how there are many different actors in the climate arena of international law).

structural decentralization and interest diversity is more likely to lead, especially in complex issue-areas, to an array of narrowly-focused regimes, rather than to a single, comprehensive and integrated regime. The various narrowly-focused regimes tend to be linked to various degrees and can be mutually reinforcing, but can also, at times, be in conflict. The array is often a result of various regimes that were established at different times, and there is no hierarchy between them. However, it does not necessarily entail that there is no core regime(s) or linkages between the various regimes, though that is also possible. The middle ground between a single comprehensive regime and a fragmented stockpile of unrelated regimes is the regime complex.

Regime complexes are not a result of an intentional decision and design. Nevertheless, at a certain point, some kind of pattern may be revealed, or connections made between those various regimes. As Keohane and Victor noted, regime complexes are marked by connections between the elemental regimes, and the absence of an overall architecture or hierarchy.¹⁹⁷

Across the various issue-areas of global governance, centralization is un-attainable, and fragmentation and regime complexes are the reality. Ruggie similarly observed:

Traditional forms of international legalization and negotiation through universal consensus-based institutions are stagnating. Regime complexes that often embody divergent norms dominate previously coherent rule systems . . . the ideal solution of comprehensive and integrated regimes . . . is increasingly unattainable . . .¹⁹⁸

Are regime complexes a problem or a blessing? Keohane and Victor assert that efforts to build an effective, legitimate, and adaptable, comprehensive regime on climate change are unlikely to succeed, and therefore a regime complex is likely to persist. However, they argue that a climate change regime complex, if it meets specified criteria, has advantages over any politically feasible comprehensive regime, particularly with respect to adaptability and flexibility. These characteristics are

197. *Id.* at 7.

198. Ruggie, *Global Governance*, *supra* note 13, at 5, 6.

particularly important in an environment of high uncertainty. Indeed, regime complexes are not just politically more realistic; they also offer some significant advantages including flexibility in substantive content and scope.¹⁹⁹

Nye similarly stresses the advantages of regime complexes, in which the loose coupling among issues permits cooperation among actors in some areas at the same time that they have disagreements in others. As he further notes:

What regime complexes lack in coherence, they make up in flexibility and adaptability. Particularly in a domain with extremely volatile technological change, these characteristics help both states and non-state actors to adjust to uncertainty. Moreover, they permit the formation of clubs or smaller groupings of like-minded states than can pioneer the development of norms that may be extended to larger groups at a later time.²⁰⁰

The loose coupling among issues, that characterizes regime complexes, “permits cooperation among actors in some areas at the same time that they have disagreements in others,” therefore allowing gradual and segmented progress.²⁰¹ Actors may agree on one topic while discussion still continues on another topic. . Alternatively, some actors may opt to link issues, asking for a simultaneous discussion of two or more issues for joint settlement, and thus conditioning or linking their support for one regime with other actors’ support in a regime of their interest. Such issue-linkage, considered by Keohane an integral part of international regimes,²⁰² can be fruitful but might also stall the establishment of regimes.²⁰³ Where a

199. Keohane & Victor, *supra* note 192, at 2.

200. Nye, *supra* note 188, at 9.

201. *Id.*

202. KEOHANE, *AFTER HEGEMONY*, *supra* note 182, at 89–92, 103 (noting “principles and rules of the regime, since they facilitate linkage among issues, will in such circumstances render pursuit of myopic self-interest less attractive”).

203. There is extensive academic literature on the topic of issue linkage. *E.g.*, KEOHANE & NYE, *supra* note 182; HEATHER ELKO MCKIBBEN, *STATE STRATEGIES IN INTERNATIONAL BARGAINING: PLAY BY THE RULES OR CHANGE THEM?* 178–213 (2015); Christina L. Davis, *International Institutions and Issue Linkage: Building Support for Agricultural Trade Liberalization*, 98 *AM. POL. SCI. REV.* 153 (2004); Michael D. McGinnis, *Issue Linkage and the Evolution of International*

linkage is made, it may allow bargains across topics and increase what is at stake – the sum of the linked issues. It resembles an ‘all or nothing’ situation, and the result can be either. In terms of membership, some regimes emerge with a limit cohort of members, e.g., on a regional level or of like-minded states. This serves as local-scale experimentation, where other actors can observe the regime’s outcomes and choose whether to join it or to support a similar regime on a larger scale. Together, the above features of regime complexes may promote the pursuit of feasible, effective and sustainable regimes.

In a decentralized international society, regime complexes, like fragmentation, are both inevitable and advantageous, as they are effective in promulgating governance.

C. *Polycentric Governance*

The theory of polycentric governance and the empirical support it received from the study of the management of common-pool resources (CPRs), fall under the broad field of political economy and under the more specific fields and labels of institutional analysis, New Institutional Economics (NIE)²⁰⁴ and economic governance.²⁰⁵

Cooperation, 30 J. CONFLICT RESOL. 141 (1986); Ernst B. Haas, *Why Collaborate? Issue-Linkage and International Regimes*, 32 WORLD POL. 357 (1980); Robert O. Keohane & Joseph S. Nye, *Power and Interdependence Revisited*, 41 INT’L ORG. 725, 735–36 (1987) (commenting on the progress on the issue of linkage since the author’s previous paper); Paul Poast, *Does Issue Linkage Work? Evidence from European Alliance Negotiations, 1860 to 1945*, 66 INT’L ORG. 277 (2012); James K. Sebenius, *Negotiation Arithmetic: Adding and Subtracting Issues and Parties*, 37 INT’L ORG. 281 (1983); Arthur A. Stein, *The Politics of Linkage*, 33 WORLD POL. 62 (1980); Robert D. Tollison & Thomas D. Willett, *An Economic Theory of Mutually Advantageous Issue Linkages in International Negotiations*, 33 INT’L ORG. 425 (1979).

204. See Handbook of New Institutional Economics 1–18 (Claude Ménard & Mary M. Shirley eds., 2005) (explaining New Institutional Economics, its domain, related modes of governance, and institutional change).

205. See THE ECON. SCI. PRIZE COMM. OF THE ROYAL SWEDISH ACAD. OF SCI., SCIENTIFIC BACKGROUND ON THE SVERIGES RIKSBANK PRIZE IN ECONOMIC SCIENCES IN MEMORY OF ALFRED NOBEL 2009: ECONOMIC GOVERNANCE 1–14 (2009) (describing the contributions of Elinor Ostrom and Oliver Williamson to understanding economic governance).

It was Polanyi who first conceptualized polycentricism,²⁰⁶ a concept that spread into several disciplines.²⁰⁷ Vincent Ostrom, Tiebout, and Warren first introduced the concept of “polycentric governance.”²⁰⁸ Vincent and Elinor Ostrom continued to develop the concept of polycentric governance together with other scholars at the Ostrom Workshop in Political Theory and Policy Analysis (also known as the Bloomington school).²⁰⁹ The theory of polycentric governance is “the Bloomington school’s most distinctive and innovative extension of the political economy in public choice perspective in the domain of governance studies, the notion of polycentricity.”²¹⁰ Vincent Ostrom elaborated on the phenomenon of polycentric governance,²¹¹ and Elinor Ostrom provided both theoretical framework (the Institutional Analysis and Development (IAD) framework)²¹² and empirical support to the the-

206. MICHAEL POLANYI, *THE LOGIC OF LIBERTY* 138–42 (1951).

207. See Paul D. Aligica & Vlad Tarko, *Polycentricity: From Polanyi to Ostrom, and Beyond*, 25 *GOVERNANCE* 237, 237–51 (2012) (explaining how polycentricism spread to the study of political economy, metropolitan reform, science, constitutional democracy, common law, and positive anarchy).

208. See V. Ostrom, Tiebout & Warren, *supra* note 23, at 831 (using the concept of a polycentric political system to explain metropolitan governance).

209. See *Ostrom Workshop: People*, IND. U. BLOOMINGTON, <https://perma.cc/2CB5-QM43> (last visited Nov. 14, 2021) (listing the workshop’s directors, its advisory council and noting it has senior research fellows, visiting scholars, and post-doctoral fellows).

210. Paul Dragos Aligica & Filippo Sabetti, *Introduction: The Ostroms’ Research Program for the Study of Institutions and Governance: Theoretical and Epistemic Foundations*, in *CHOICE, RULES AND COLLECTIVE ACTION: THE OSTRMS ON THE STUDY OF INSTITUTIONS AND GOVERNANCE* 1, 9 (Filippo Sabetti & Paul Dragos Aligica eds., 2014).

211. *E.g.*, Vincent Ostrom, *Polycentricity (Part 1)*, in *POLYCENTRICITY AND LOCAL PUBLIC ECONOMIES: READINGS FROM THE WORKSHOP IN POLITICAL THEORY AND POLICY ANALYSIS* 52–74 (Michael D. McGinnis ed., 1999); VINCENT OSTROM, *THE MEANING OF AMERICAN FEDERALISM: CONSTITUTING A SELF-GOVERNING SOCIETY* 223–44 (1991) [hereinafter V. OSTROM, *AMERICAN FEDERALISM*].

212. See Michael D. McGinnis, *An Introduction to IAD and the Language of the Ostrom Workshop: A Simple Guide to a Complex Framework*, 39 *POL’Y STUD. J.* 169, 169 (2011) (noting how the Institutional Analysis and Development Framework that Elinor Ostrom developed “encapsulates the collective efforts of this intellectual community to understand the ways in which institutions operate and change over time”).

ory.²¹³ Elinor Ostrom studied diverse institutional arrangements for governing common-pool resources (CPRs) and public goods. She was awarded the 2009 Nobel Prize in Economic Sciences for her contribution to the understanding of economic governance, especially that of the commons.

I define a monocentric system as a hierarchical system, with a single decision-making center, that enjoys a monopoly on power.²¹⁴ I define polycentric governance as a case of decentralized governance in which there are multiple independent centers of decision-making ('governance centers'), with at least partial overlap in jurisdictions. The governance centers interact and collaborate to a certain extent, or take each other into account, in complex and ever-changing ways. Out of these seemingly uncoordinated processes of mutual adjustment, emerges the repertoire of norms and rules that guide the behavior of actors within the entire realm.²¹⁵

213. See ELINOR OSTROM AND THE BLOOMINGTON SCHOOL OF POLITICAL ECONOMY: POLYCENTRICITY IN PUBLIC ADMINISTRATION AND POLITICAL SCIENCE 37, 39, 112, 172, 186 (Daniel H. Cole & Michael D. McGinnis eds., 2014) (noting Elinor Ostrom's empirical studies in multiple and diverse fora and how they have supported her theoretical framework).

214. Cf. Vincent Ostrom, *Polycentricity*, in POLYCENTRICITY AND LOCAL PUBLIC ECONOMIES: READINGS FROM THE WORKSHOP IN POLITICAL THEORY AND POLICY ANALYSIS 52–74 (Michael D. McGinnis ed., 1999) ("The essential defining characteristic for a monocentric political system is one where the governmental prerogatives for determining, enforcing and altering legal relationships is vested in some single office or decision structure which has an ultimate monopoly over the legitimate exercise of coercive capabilities in some particular society.").

215. According to Vincent Ostrom, Charles Tiebout, and Robert Warren: '[p]olycentric' connotes many centers of decision-making which are formally independent of each other. Whether they actually function independently, or instead constitute an interdependent system of relations, is an empirical question in particular cases. To the extent that they take each other into account in competitive relationships, enter into various contractual and cooperative undertakings or have recourse to central mechanisms to resolve conflicts, the various political jurisdictions in a metropolitan area may function in a coherent manner with consistent and predictable patterns of interacting behavior. To the extent that this is so, they may be said to function as a 'system.'

V. Ostrom, Tiebout & Warren, *supra* note 23, at 831. Cf. McGinnis, *supra* note 212 ("Polycentricity is a system of governance in which authorities from overlapping jurisdictions (or centers of authority) interact to determine the conditions under which these authorities, as well as the citizens subject to

This description of polycentric governance resembles that of international regimes—decentralized governance that is not based on rules imposed from above, but rather on rules and mechanisms devised by the collective action of several actors or governance centers. Absent a central global authority, governance at the global level is made by the actors and is therefore also decentralized. What characterizes polycentric governance is decentralization, and at this point it correlates to international regimes and global governance. Moreover, global governance may already fit the definition of a polycentric system as there are multiple decision-making centers, notably the United Nations and its agencies and powerful actors like the OECD, G7, and major powers.

The conventional wisdom was that multiplicity of political units makes governance “a pathological phenomenon” and that “too many governments [is] not enough government.”²¹⁶ However, as the Bloomington School demonstrated, the merits of polycentric governance outweigh the shortcomings. The study of the problem of metropolitan government demonstrated that “the existence of multiple agencies interacting and overlapping, far from being a pathological situation, ‘may be in fact a natural and healthy one.’ This overlapping and duplication is the result of the fact that different services require a different scale for efficient provision and that principles of division of labor, cooperation, and exchange function in the public sector, too.”²¹⁷ As Vincent and Elinor Ostrom noted, duplication of functions is assumed to be wasteful and inefficient, yet market economy is efficient precisely because of the existence of multiple suppliers of a single product or service—

these jurisdictional units, are authorized to act as well as the constraints put upon their activities for public purposes.”); Michael D. McGinnis, *Polycentric Governance in Theory and Practice: Dimensions of Aspiration and Practical Limitations 1* (Feb. 29, 2016) (unpublished manuscript), <https://perma.cc/SC4R-P664> (“In an ideal-typical system of polycentric governance, a diverse array of communities and public and private authorities with overlapping domains of responsibility interact in complex and ever-changing ways, and out of these seemingly uncoordinated processes of mutual adjustment emerges a persistent system of social ordering that can support and sustain capacities for individual liberty, group autonomy, and community self-governance.”).

216. Aligica & Tarko, *supra* note 207, at 241 (internal quotation marks omitted).

217. *Id.* at 241.

i.e., competition.²¹⁸ Similar forces operate in a public economy and the duplication is also efficient in public governance.²¹⁹ Furthermore, polycentric systems have “a built-in mechanism of self-correction,” as they provide more opportunity for actors to intervene and correct, which contributes to the success of such systems.²²⁰ Writing on polycentric governance regarding climate change, E. Ostrom asserted that polycentrism is a long-term reality, but also an effective way of addressing problems that would otherwise reach a gridlock.²²¹

Polycentricity does not necessarily mean the absence of a center.²²² Andersson and E. Ostrom compared regimes with differing degrees of decentralization: highly decentralized, semi-decentralized, and highly centralized, and warned against the dangers of over-decentralization.²²³

Much of the experience with innovative approaches to governance, at the international level, involves natural resources and the environment.²²⁴ The literature on governance

218. *Id.* at 241–42.

219. Vincent Ostrom & Elinor Ostrom, *A Behavioral Approach to the Study of Intergovernmental Relations*, 359 ANN. AM. ACAD. POL. & SOC. SCI. 137, 146 (1965) (concluding the “absence of an efficient market arrangement for the private provision of goods and services does not necessarily mean that public provision of goods and services under nonmarket conditions will assure efficient solutions” even where diverse public enterprises exist).

220. Aligica & Tarko, *supra* note 207, at 246. *See also* Elinor Ostrom, *The Comparative Study of Public Economies*, 61 AM. ECONOMIST 91, 97 (2009) (noting how “large, medium, and small governmental and nongovernmental enterprises engage in both competitive and cooperative relationships,” thereby facilitating a “modified form of competition [that] is viewed as a method for reducing opportunistic behavior”).

221. *See* Elinor Ostrom, *A Polycentric Approach for Coping with Climate Change*, 12, 39 (World Bank Policy Research Working Paper No. 5095), <https://perma.cc/L59R-LDYM> (noting the long-term horizon for addressing climate change but noting the benefits of a polycentric approach to addressing the problem).

222. *See* V. Ostrom, Tiebout & Warren, *supra* note 23, at 841–42 (noting that some activities of municipal governance require a strong central authority).

223. *See* Krister P. Andersson & Elinor Ostrom, *Analyzing Decentralized Resource Regimes from a Polycentric Perspective*, 41 POL’Y SCI. 71, 82 (2008) (comparing “one highly decentralized (Guatemala), one semi-decentralized (Bolivia), with one highly centralized regime (Peru”).

224. *See* ORAN R. YOUNG, *Rights, Rules, and Resources in World Affairs*, in GLOBAL GOVERNANCE: DRAWING INSIGHTS FROM THE ENVIRONMENTAL EXPERIENCE 2 (Oran R. Young ed., 1997) (“Innovative approaches to governance

of CPRs, led by E. Ostrom, provides an extensive body of theoretical and empirical knowledge. Ostrom refuted Hardin's classic "tragedy of the commons" and found strong empirical proof, in the lab and in the field, across countries and sectors, favoring polycentric governance of complex economic systems.²²⁵ Ostrom also suggested that the "core goal of public policy should be to facilitate the development" of such decentralized local institutions, rather than impose rules from above.²²⁶ Ostrom further provides "design principles" for building effective institutions.²²⁷

Polycentric governance, like regime complexes and fragmentation, is both inevitable and advantageous. In a decentralized metropolitan or international system, polycentric governance is both inevitable and effective in providing governance.

D. *Cross-discipline Convergence of Theories*

As demonstrated above, fragmentation, regime complexes and polycentric governance are each a version or conceptualization of decentralized governance and each concept proves to have merits that outweigh the shortcomings. These three concepts are mostly studied separately, in the three different disciplines,²²⁸ but *there is convergence of the underlying causes, characteristics and, significantly, insights, of the three theories*

have had the greatest impact on issues pertaining to natural resources and the environment.").

225. ELINOR OSTROM, *GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION* 2, 182–92 (1st ed. 1990) (examining several instances where the use of CPRs did not result in a tragedy of the commons).

226. E. Ostrom, *Beyond Markets and States*, *supra* note 21, at 665.

227. OSTROM, *supra* note 225, at 89–91; THE ECON. SCI. PRIZE COMM. OF THE ROYAL SWEDISH ACAD. OF SCI., *supra* note 205, at 11.

228. *See also* LOCAL COMMONS AND GLOBAL INTERDEPENDENCE 1 (Robert O. Keohane & Elinor Ostrom eds., 1995) [hereinafter LOCAL COMMONS] (discussing the similar problems that at the international level there is no hierarchy and authority enforcing cooperation and that in the smaller CPRs there is no hierarchy of government officials creating rules or enforcing agreements); NYE, *supra* note 188, at 6 (discussing "commons" and club goods, notions at the basis of the study of CPRs, and referring to the work of Ostrom on CPR). *But see* REGIME INTERACTION, *supra* note 168, at 2 (combining international law and international relations and discussing "regimes," including fragmentation of international law and conflicting regimes, and how regimes interact in a situation of ongoing diversity).

of decentralized governance. This paper builds on this convergence to argue the case for polycentric space governance and possibly for polycentric governance of other issue-areas in global affairs.

Regime complexes and fragmentation both describe phenomena in the international level and emanate from a decentralized international society. The concept of polycentric governance was studied mainly on the national level and emanates from the sub-national decentralization in metropolitan areas and also from the realities and needs of the management of CPRs. Though polycentric governance was studied mainly in the national level, it can and should be applied to global affairs. Ostrom herself, together with Dietz and Stern, suggested that many of the general principles for robust governance systems for local resources “also appear to be applicable to regional and global resources, although they are less well tested at those scales.”²²⁹ Keohane and Elinor Ostrom contemplated convergence between the literatures on local commons and that on international regimes,²³⁰ each demonstrating the feasibility of collective action without hierarchical authority. Moreover, they also noted that “many of the ‘design principles’ underlying successful self-organized solutions to CPR problems appear relevant to the design of institutions to resolve problems of international cooperation, as well as those at a strictly local level.”²³¹ Moreover, Elinor Ostrom’s work is more methodologically rigorous, theoretically and empirically, than the IR literature.²³² The potential research regarding applying Elinor Ostrom’s theory to global affairs, barely pursued, leaves, as Keohane noted, “unexploited opportunities” for investigators who seek to understand issues in global affairs.²³³

229. Thomas Dietz, Elinor Ostrom & Paul C. Stern, *The Struggle to Govern the Commons*, 302 SCIENCE 1907, 1910 (2003).

230. LOCAL COMMONS, *supra* note 228, at 2. See also Robert O. Keohane, *Review Symposium: Beyond the Tragedy of the Commons*, 8 PERSP. POL. 577, 577–79 (2010) [hereinafter Keohane, *Review Symposium*] (noting that Ostrom’s work is “potentially an important contribution to the study of world politics” and the similarities between questions surround the local and global commons).

231. LOCAL COMMONS, *supra* note 228, at 2.

232. Keohane, *Review Symposium*, *supra* note 230, at 579.

233. *Id.*

The cumulative insights from the literature on fragmentation, regime complexes and polycentric governance are that decentralization is inevitable and a phenomenon that is here to stay. This is not surprising, considering the decentralized structure of the international society. The cumulative insights also indicate the advantages of decentralized governance and, just as important, how the adverse effects of decentralization can be mitigated.

Decentralized governance has numerous advantages. First and foremost, it facilitates achieving governance, under anarchy, e.g., by incremental evolution, formation of clubs or smaller groupings of like-minded actors than can pioneer the development of norms that may be extended to larger groups at a later time, cooperation among actors in some areas even if they have disagreements in others, and experimentation with different approaches. Decentralized governance is flexible and adaptable, which is especially important where rapid technological developments are concerned, and it enables meaningful participation of users and experts in governance. At the end of the day, decentralized global governance is an institutional expression of political pluralism internationally.

The next section presents the case for polycentric governance of space activities and the need to adapt the roles of the multilateral institutions.

V. THE CASE FOR POLYCENTRIC SPACE GOVERNANCE

A. *Embracing Polycentricism*

The realities leading to the decentralization of global affairs are here to stay, and therefore so too is the decentralization of global governance, and space governance in particular. It is unlikely that a centralized, monocentric governance of global affairs can be achieved given present constraints. Decentralization is the inevitable future of global governance, as well as space governance, and only a fundamental change in global politics could change this course of events. The findings presented above on the merits of decentralized governance, are therefore, good news. This paper therefore suggests embracing polycentric governance as a model for space govern-

ance, and possibly for the governance of other issue-areas in global affairs or even for global affairs in general.²³⁴

As this paper demonstrated, space governance is already on track to become polycentric, as stakeholders and experts establish various forums that suggest, adopt or push for rules and standards. Thus, polycentric governance emerges organically from the reality of global affairs.

Embracing polycentric space governance means facilitating and encouraging stakeholders-led governance of separate sub-issue-areas, by forming separate, issue-area-specific governance centers, which will together encompass the vast majority of the entire issue-area of space activities, and which may be interconnected by a joint coordinating forum. This polycentric model will create the basis for larger scale cooperation and governance on a global level. A set of semi-independent governance centers, loosely interconnected, is feasible, and even more efficient than a centralized governance or a single comprehensive institution or forum. Polycentric governance is feasible, it is flexible, and it allows for gradual adaptation and self-correction. The flexibility of polycentric governance is particularly important in the context of space governance, as the technologies and policies are constantly developing. It is therefore difficult and counterproductive to establish rigid institutions and regimes, except for the basic norms, principles, and rules which are already in place. Where the unknown outweighs what is known, and where we expect new and major discoveries, achievements, and challenges, adopting a flexible regime is preferred. Much is unknown about future space exploration and utilization. The technological, economical, legal, and sociological developments, even revolutions, necessitate a flexible governance regime that will be able to entertain

234. Vincent Ostrom, building on Madison, contemplated the universal application of polycentric governance, to “the whole system of human affairs, private as well as public.” V. OSTROM, *AMERICAN FEDERALISM*, *supra* note 211, at 223–44, 224 (quoting *THE FEDERALIST* No. 51, at 349 (James Madison) (Cooke ed., 1961)). The Holy Roman Empire serves as a precedent for polycentric governance at the supranational level, being an amorphous central European political entity, encompassing numerous peoples in a polycentric system lacking even a permanent capital. *See* PETER H. WILSON, *THE HOLY ROMAN EMPIRE: A THOUSAND YEARS OF EUROPE’S HISTORY* 5, 7, 181 (2017) (noting the “Empire was governed without creating a large, centralized infrastructure”).

adjustments to suit developing governance needs. A rigid regime will delay development. The suggested polycentric governance regime provides the required flexibility that is capable of accommodating changes. It works according to current space law and can accommodate current international organizations at the higher levels as central coordinating forums. Those higher-level layers will promote the interaction between the various governance centers and direct the system as a whole.

B. *The Key Role of Stakeholders and Experts in Space Governance*

Institutional design includes constitutional-level rules that specify the participants, how authority is distributed, and how rules can be made,²³⁵ or what Hart would call “secondary rules.”²³⁶ Central to polycentric governance is users’ self-organization or self-governance, i.e., that users organize themselves to address shared problems and interests.²³⁷ In self-governance, the users of the CPR (e.g., fishermen fishing from the same lake, farmers using the same water basin) themselves establish, modify, and possibly enforce the rules regulating the

235. See Vincent Ostrom, *A Forgotten Tradition: The Constitutional Level of Analysis*, in POLYCENTRIC GOVERNANCE AND DEVELOPMENT: READINGS FROM THE WORKSHOP IN POLITICAL THEORY AND POLICY ANALYSIS 151–66 (Michael D. McGinnis ed., 1999) (explaining that, in American constitutionalism, “[a]uthority must be distributed in a way that all authority is subject to limits and no one, or no one set of decision makers, is permitted to gain dominance over the rest”); see also LARRY L. KISER & ELINOR OSTROM, *The Three Worlds of Action: A Metatheoretical Synthesis of Institutional Approaches in POLYCENTRIC GAMES AND INSTITUTIONS: READINGS FROM THE WORKSHOP IN POLITICAL THEORY AND POLICY ANALYSIS* 56–83 (Michael D. McGinnis ed., 2000) (explaining that “rules delineating the participants and allowable actions, rules distributing authority among participants, [and] rules aggregating participants’ choices into collective decisions” characterize all institutional arrangements).

236. H. L. A. HART, *THE CONCEPT OF LAW* 94 (1961).

237. See Bryan Bruns, *Putting Polycentric Governance into Practice*, in GOVERNING COMPLEXITY: ANALYZING AND APPLYING POLYCENTRICITY 241 (Andreas Thiel, William A. Blomquist & Dustin E. Garrick eds., 2019) (“A polycentric perspective emphasizes the potential for self-governance, problem-solving arising from the initiative of people organizing themselves.”); Marcel J. Dorsch & Christian Flachsland, *A Polycentric Approach to Global Climate Governance*, 17 GLOBAL ENVTL. POL. 45, 51 (2017) (“Self-organization is a key underlying concept in the polycentric literature.”).

use and protection of a common resource.²³⁸ As Elinor Ostrom noted, “[c]rafting development-enhancing institutions is an ongoing process that must directly involve the users. Instead of designing a single blueprint for all places and circumstances, officials need to enhance the capability of social actors to design their own institutions.”²³⁹

Elinor Ostrom demonstrated that self-governance brings sustainable results. Empirical studies on governance of CPRs made in various States regarding various types of CPRs demonstrated that resource users were successful in organizing themselves and managing CPRs, often better than governments.²⁴⁰ The evidence demonstrated that users establish rules that better suit the conditions and needs, and tend to follow those rules more than they follow rules imposed from above. They have both the intimate knowledge of local conditions and the interest and incentive to devise and follow adequate rules. Users also devise a variety of formal and informal mechanisms and ways of monitoring and sanctioning, especially when they have economic rights, e.g., when they are given harvesting rights. Users’ monitoring and sanctioning proved to be better than that imposed from the top. The leading role of users is crucial in the successful governance of CPRs. Indeed, “a common factor in ensuring successful governance of CPRs is the active participation of resource users in the management of the flow of benefits from the resources.”²⁴¹

Self-governance can emerge in cases of little to no government involvement but can also be facilitated or even en-

238. E. Ostrom, *supra* note 225, at 18–21, 93.

239. Paul Dragos Aligica, *Rethinking Institutional Analysis: Interviews with Vincent and Elinor Ostrom*, MERCATUS CTR. (Oct. 12, 2009), <https://perma.cc/WG59-JSCG>.

240. E. Ostrom, *Beyond Markets and States*, *supra* note 21, at 649.

241. Elinor Ostrom, *Beyond Markets and States: Polycentric Governance of Complex Economic Systems*, in CHOICE, RULES AND COLLECTIVE ACTION: THE OSTRMS ON THE STUDY OF INSTITUTIONS AND GOVERNANCE 196 (Filippo Sabetti & Paul Dragos Aligica eds., 2014). *See also* Jeremy S. Brooks, Margaret A. Franzen, Christopher M. Holmes, Mark N. Grote & Monique Borgerhoff Mulder, *Testing Hypotheses for the Success of Different Conservation Strategies*, 20 CONSERVATION BIOLOGY 1528, 1530 (2006) (“The benefits of decentralization derive from the assumption that local bodies will be more responsive to conservation initiatives than national government.”).

couraged by the government.²⁴² Users organize themselves by convening forums, gathering and sharing knowledge and establishing self-governing mechanisms, *e.g.*, organizations and institutions.²⁴³

The viability of self-governance is one of the most important lessons from Ostrom to space governance. Stakeholders-based governance is not just advantageous in the realm of space activities, for the reasons mentioned, it is also inevitable. In the context of space governance, self-organization or self-governance means that stakeholders will lead to the creation, and possibly also monitoring and enforcement, of the relevant rules. Stakeholders are those actors who are directly involved in a certain sub-issue-area and therefore have stakes in its successful governance. It is the equivalent of ‘users’ in the CPR literature. These stakeholders may include most of the States or a handful of them, and may also include non-State actors. On one extreme, virtually all States are using radio frequencies and are therefore stakeholders, and on the other extreme, with regard to weaponization, the actual or potential producers of space weapons include no more than three to five actors: the United States, Russia, China, India, and the European Union. In the mining of space natural resources, private companies play a leading role and are therefore also stakeholders. Thus, the ‘users’ or ‘stakeholders’ of the weaponization issue may be those who develop or have the capacity to develop space weapons; the users/stakeholders of the debris issue are all those who create debris; and the users/stakeholders of the Moon are all those who, at the relevant time, have presence on or are in close vicinity of the Moon. Many States have satellites in orbit (indigenous or procured), and all those States should participate in the regime allocating slots.

Polycentric governance therefore means that stakeholders play a central role in the governance of the sub-issue-area in which they are directly involved. The stakeholders have an incentive to play a significant role, but also they have knowledge that can contribute to the governance of that issue-area. In the

242. In Japan the state used laws in order to encourage the development of self-governance in the early 1900s. Ashutosh Sarker, Toru Ikeda, Takaki Abe & Ken Inoue, *Design Principles for Managing Coastal Fisheries Commons in Present-Day Japan*, 117 *ECOLOGICAL ECON.* 32, 33 (2015).

243. Bruns, *supra* note 237, at 237–41.

ITU regime, for example, stakeholders, including private companies and other telecommunication operators, actively participate in ITU conferences and standard setting meetings. In this sense, the addition of actors who are non-stakeholders might stall, or even prevent, the evolution of a governance system. We can further envision that commercial entities active in space, and even persons who populate space habitats, participate in making the rules directly applicable to them, although they might have diminished rights and duties compared to the States. Yet, this does not mean there are no other participants allowed to contribute to this governance. The governance of each sub-issue-area should also consider the concerns and the interests of future users, and global public policy in general. These may be represented by UNOOSA and NGOs like the Secure World Foundation. When, further down the road, space habitats are established, the people who populate these habitats should have an important role in their governance. While the ISS is governed in a semi-military hierarchy, a space habitat should adopt a more democratic system, with a significant voice for the inhabitants.

Governance mechanisms that will facilitate development of space technologies, activities and commerce, must directly involve the stakeholders. However, there is a caveat that the concurrent representation of future stakeholders and other indirectly affected actors, as well as global public policy, is similarly necessary. In addition, discussion on the issue of distribution of space benefits must include all nations. UNOOSA is positioned to represent global public policy and UN-COPUOS is an appropriate forum to discuss the issue of distribution.

The Antarctic Treaty System is an example of users'/stakeholders' self-regulation. The Antarctic Treaty (which is *not* a U.N. treaty), and its nearly 200 supplementing instruments, form together the Antarctic Treaty System (ATS).²⁴⁴ ATS provides a flexible, incremental system that can be amended and supplemented without the need to amend the

244. Oran R. Young, *Governing International Spaces: Antarctica and Beyond*, in *SCIENCE DIPLOMACY: ANTARCTICA, SCIENCE, AND THE GOVERNANCE OF INTERNATIONAL SPACES* 292 (Paul Arthur Berkman, Michael A. Lang, David W. H. Walton & Oran R. Young eds., 2011) (discussing the ATS and its implications).

treaty itself.²⁴⁵ However, the most notable feature is that all of these amendments and additions are made by those nations States that are active in Antarctica, *and only by them*. “Countries that do not operate in Antarctica are justifiably excluded from altering the treaties that govern the region.”²⁴⁶ The ATS has proven to be a stable, effective, comprehensive, and adaptable system.

There may be various types of users/stakeholders. In the case studies analyzed by Ostrom there was typically one kind of user, and consumers were not considered as users. The fishermen in a lake were users, not those who buy fish. In the context of space activities, by contrast, there may be several kinds of users. Users of a spaceport, space station or a Moon base include the actors establishing and operating those installations and the users of those installations, such as those who launch, dock or land there (those are also consumers, but distinguished from end-consumers, such as smartphone holders using a GPS, which would still not be regarded as users). All actual users would take part in the management, as described in the above principles, but perhaps with varying responsibilities and competences. The composition of the forum and the rule-making mechanism should allow for efficient governance.

Experts should also play a key role in space governance, as they bring the shared values and accumulated policy-oriented knowledge of epistemic communities. An epistemic community, as conceptualized by Haas, is “a network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area.”²⁴⁷ It is a network of individ-

245. *Id.*

246. Pascale Ehrenfreund, Margaret Race & David Labdon, *Responsible Space Exploration and Use: Balancing Stakeholder Interests*, 1 *NEW SPACE* 60, 63 (2013).

247. Peter M. Haas, *Introduction: Epistemic Communities and International Policy Coordination*, 46 *INT'L ORG.* 1, 3 (1992) [hereinafter Haas, *Introduction*]. See also Peter Haas, *Epistemic Communities*, in *THE OXFORD HANDBOOK OF INTERNATIONAL ENVIRONMENTAL LAW* 793 (Daniel Bodansky, Jutta Brunnée & Ellen Hey eds., 2008) (“Epistemic communities are networks—often transnational—of knowledge-based experts with an authoritative claim to policy relevant knowledge within their domain of expertise.”); Mai’a K. Davis Cross, *Re-thinking Epistemic Communities Twenty Years Later*, 39 *REV. INT'L STUD.* 137, 137 (2013) (describing epistemic communities as “professional networks with authoritative and policy-relevant expertise”). See generally ANDREA BI-

ual professionals or experts who come from various sectors (government, industry, academe) and States, and they communicate and exchange knowledge and ideas, e.g., through conferences. Academic disciplines and professional societies are also epistemic communities. They point out problems and offer solutions, aimed at other members of the epistemic community and also policymakers. Experts often share some basic norms, values, or beliefs. There are also other conceptualizations for the networks of individuals with influence on national and global policy, notably policy networks and policy communities,²⁴⁸ (transnational) advocacy networks,²⁴⁹ and transnational or global policy networks.²⁵⁰ Epistemic communities are particularly important and influential in issue-areas characterized by novelty and technical complexity,²⁵¹ hence their demonstrable importance for the space sector.

Epistemic communities create and disseminate knowledge and ideas and facilitate the agreement on the basics of

ANCHI, *Epistemic Communities*, in CONCEPTS FOR INTERNATIONAL LAW: CONTRIBUTIONS TO DISCIPLINARY THOUGHT 252–56 (Jean d’Aspremont & Sahib Singh eds., 2019) (providing a genealogy of the concept of epistemic communities).

248. See, e.g., WILLIAM D. COLEMAN, *Policy Networks*, in INTERNATIONAL ENCYCLOPEDIA OF THE SOCIAL & BEHAVIORAL SCIENCES 314 (James D. Wright ed., 2nd ed. 2015) (“The concept of a policy network first emerged in the 1980s and early 1990s as a means to study the changing forms of public policy making, particularly the shift from vertical to more horizontal decision making in state.”); Michael M. Atkinson & William D. Coleman, *Policy Networks, Policy Communities and the Problems of Governance*, 5 GOVERNANCE 154, 156 (1992) (“‘Policy network’ and the related notion of ‘policy community’ constitute two of the most important conceptual innovations to emerge from this more catholic approach to the policy process.”); Mark Thatcher, *The Development of Policy Network Analyses: From Modest Origins to Overarching Frameworks*, 10 J. THEORETICAL POL. 389, 390 (1998) (analyzing “the major groups of policy network approaches, using an ‘intellectual history’ framework”).

249. E.g., MARGARET E. KECK & KATHRYN SIKKINK, *ACTIVISTS BEYOND BORDERS: ADVOCACY NETWORKS IN INTERNATIONAL POLITICS* 2 (1998).

250. E.g., Diane Stone, *Global Public Policy, Transnational Policy Communities and Their Networks*, 36 POL’Y STUD. J. 19, 31–33 (2008).

251. Haas, *Introduction*, *supra* note 247, at 12–14. See also Claire A. Dunlop, *The Irony of Epistemic Learning: Epistemic Communities, Policy Learning and the Case of Europe’s Hormones Saga*, 36 POL’Y SOC’Y 215, 219 (2017) (“Epistemic communities’ claims to highly specified policy-relevant knowledge about a complex issue revolve not only around the expertise of the individual members. They must also collectively embody a belief system around an issue.”).

the discourse, policy, and action, e.g., basic concepts, norms, values, and methodologies. Epistemic communities are not themselves part of a national government, intergovernmental organization, but they influence global policy in their issue-area. By the knowledge and expertise they bring, they have an important role in the construction and operation of governance centers and in polycentric governance in general.²⁵² Experts and epistemic communities drove the first wave of international organizations by establishing experts-led international organizations such as the ITU.²⁵³ With the caveat of representation and of addressing the concerns of future stakeholders and other indirectly affected actors, stakeholders, and experts should have a leading role in space governance.

C. *Adapting the roles of the multilateral institutions*

A polycentric governance system ideally has basic principles and coordinating institutions. The 1967 Outer Space Treaty can and should be the foundation for all separate governance centers. The various governance centers should be in conformity with the OST. UNOOSA, in addition to its role as representing global public interest and the interests of non-participating actors, can provide crucial support and coordination between the various governance centers. Of particular importance is the facilitation of communication and interaction between the various governance centers: with other governance centers and with the main institutions (notably UNCOPUOS). These interactions would determine, in large part, the nature of the entire system of space governance. In a polycentric system, as in all complex systems, “[t]he interactions matter more than the nature of the units.”²⁵⁴ UN-

252. See also Bruns, *supra* note 237, at 238 (suggesting governance systems should “[e]nable institutional artisans to make agreements and put them into operation, for example through customary local governance practices, special districts, devolution of authority, contracts with service providers, court backing for binding agreements, and other mechanisms”).

253. See Tepper, *Big Bang*, *supra* note 101, ch. 2 (“International organizations established to facilitate international communication include the ITU which was established in 1865 to regulate the use of telegraph communication and opened the first wave of international organizations.”).

254. Nassim Taleb, *The Most Intolerant Wins: The Dictatorship of the Small Minority*, NASSIM TALEB (Aug. 19, 2016), <https://perma.cc/N8KV-CSBW>. See also Rakhyun E. Kim, *The Emergent Network Structure of the Multilateral Environ-*

COPUOS, which is already arguably “at crossroads, . . . ‘looking for its *raison d’être* in the new Millennium,’”²⁵⁵ would need to adopt this function, i.e. serving as a forum for multilateral discussions on broad systemic principles that apply across the governance centers, and those questions that affect non-users. For example, as mentioned previously, while only a few actors will execute mining in space, all States, and humankind in general, have legitimate interest in the discussion on the distribution of the benefits from space exploration in general, and from space sources in particular, including on the issue of property rights to natural space resources. Indeed, while Article I of the Outer Space Treaty provides that “[t]he exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development”, there is decades long debate on what exactly this promise means or how it would be delivered. Lyall and Larsen foretold such a change in the role of UN-COPUOS and noted that, “as space law matures and as what is required tends more and more to be private and domestic law solutions for particular problems, it may be that COPUOS will take a back seat, and substantial developments will be found elsewhere.”²⁵⁶ The role, procedure, and goals of UN-COPUOS, of course, deserve a separate through discussion.

In short, in order to implement a polycentric system for space governance in practice, the international community should work to (i) facilitate and encourage the progressive development of (ii) partly overlapping, issue-area-specific gov-

mental Agreement System, 23 GLOBAL ENVTL. CHANGE 980, 988 (2013) (“[T]he emergent network structure documented [in environmental law] exhibits several important topological properties of real-world systems, including those that are complex and adaptive.”); Joost Pauwelyn, *At the Edge of Chaos? Foreign Investment Law as a Complex Adaptive System, How it Emerged and How it can be Reformed*, 29 ICSID REV. – FOREIGN INV. L. J. 372 (2014) (drawing on complexity theory to account for trends in foreign investment law). See generally Amandine Orsini et al., *Forum: Complex Systems and International Governance*, 22 INT’L STUD. REV. 1008 (2020) (discussing the application of the concept of complex systems to global governance).

255. Brisibe, *supra* note 84, at 7 (citing S. Marchisio, *The Evolutionary Stages of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS)*, 31 J. SPACE L. 241 (2005)).

256. LYALL & LARSEN, *supra* note 82, at 18.

ernance centers; (iii) established and managed by stakeholders and experts of each sub-issue; (iv) introducing various kinds of instruments; and (iv) interconnected and observed by a multilateral coordinating forum that simultaneously represents future stakeholders, other indirectly affected actors and global public interests.

Polycentric space governance, as described in this paper, is one way in which the polycentric system can manifest, but not the only way. "There is no one strategy and no one way for building systems of polycentric ordering. We cannot expect such systems either to be constructed or to work in only one way. They have too much spontaneity and creativity to conform to a single mold."²⁵⁷ A polycentric structure of space governance may eventually take another form, but with similar basic features.

D. *Polycentric Space Governance and Space Law*

There is no fundamental adjustment to space law needed in order to allow polycentric space governance to emerge. There is nothing in current space law that prevents the establishment and functioning of separate governance centers. There is no urgent need to introduce new treaties or amend existing ones. The suggestions in this paper involve policy goals and design principles, not hard-law rules. New rules can, and should be formulated in conformity with the OST. The OST does not provide for a central authority or organization to manage outer space; a polycentric system would, therefore, not violate the treaty. The OST remains the normative framework for space governance.

Moreover, space law itself can evolve in a decentralized manner. Instruments introduced by specific governance centers may later become widely accepted and even legally binding. Even a whole body of law can evolve in a decentralized manner, as Law Merchant (*lex mercatoria*) has shown. In medieval Europe, merchants across Europe, from different places, cultures and speaking different languages developed customary rules of international trade in a private, international legal system.²⁵⁸ It was an informal body of law with, at least initially,

257. V. OSTROM, *AMERICAN FEDERALISM*, *supra* note 211, at 242.

258. See Bruce L. Benson, *The Spontaneous Evolution of Commercial Law*, 55 SOUTHERN ECON. J. 644, 647 (1989) ("Virtually every aspect of commercial

private adjudication and enforcement.²⁵⁹ This body of law developed key institutions for trade, including negotiable credit instruments, such as promissory notes and bills of exchange, critical to modern trade. Law Merchant well-served the needs of trade because it was made by those who best knew the needs. This process may be reiterated in the context of commercial space activities.

E. *Maximizing the Advantages and Mitigating the Disadvantages of Polycentric Governance*

Polycentric governance has advantages as well as disadvantages and some polycentric systems perform better than others. Despite space governance already being on track to become polycentric, action is needed in order to further this course and enhance the success of the various governance centers. “Polycentric orders are open systems that manifest enough spontaneity to be self-organizing and self-governing. But the maintenance of such orders depends upon a sufficient level of intelligent deliberation to correct errors and reform themselves.”²⁶⁰ This section offers some ways to maximize the advantages and mitigate the adverse effects of polycentric governance, though this is by no means an exhaustive list of either. Ostrom’s design principles may help maximize the advantages of polycentric governance, whereas ‘institutional deference’ and ‘global administrative law’ can mitigate its adverse effects.

transactions in all of Europe (and in cases even outside Europe) were ‘governed’ by [the *lex mercatoria*] after the eleventh century.”).

259. *See id.* at 649 (“Merchants formed their own courts to adjudicate disputes in accordance with their own laws.”); *see also* LEON E. TRAKMAN, *THE LAW MERCHANT: THE EVOLUTION OF COMMERCIAL LAW* 2 (1983) (“Within this business domain, merchant institutions were translated into legal institutions. Codes of law operating at merchant centers embodied the custom of merchants; they reflected trade habits and market usages. Most importantly, in regulating transregional trade local influences subserved to the demands of the cosmopolitan trader.”).

260. Vincent Ostrom, *Polycentricity: The Structural Basis of Self-Governing Systems*, in CHOICE, RULES AND COLLECTIVE ACTION: THE OSTROMS ON THE STUDY OF INSTITUTIONS AND GOVERNANCE 58 (Filippo Sabetti & Paul Dragos Aligica eds., 2014).

i. *Ostrom's Design Principles for Robust Governance Systems*

Regime theorists offer some criteria for assessing whether decentralized regime complexes are actually superior to integrated institutions,²⁶¹ but it is Elinor Ostrom that provides more concrete design principles, which correlate with successful governance systems, and can therefore predict to a certain extent the success of a governance model.²⁶²

Analyzing the vast database of case studies from around the world, Ostrom found regularities that correlate to and predict long-term success of a governance system, what she refers to as 'design principles.' "The design principles appear to synthesize core factors that affect the probability of long term survival of an institution developed by the users of a resource."²⁶³ While some of the design principles are well known, others are new and even surprising, and "[e]ven though these design principles do not provide an easy solution to the often complex policy problems involved, in cases where they are all heeded, [as Ostrom noted,] 'collective action and monitoring problems tend to be solved in a reinforcing manner.'²⁶⁴ While they are based on local commons, they seem to apply to global commons²⁶⁵ and to human cooperation more generally.²⁶⁶

The updated version of the design principles is comprised of the following eight design principles:²⁶⁷

261. See, e.g., Keohane & Victor, *supra* note 192, at 19–20 (suggesting six dimensions should be used to evaluate regime complexes: coherence, accountability, effectiveness, determinacy, sustainability, and epistemic equality).

262. E. OSTROM, *GOVERNING THE COMMONS* *supra* note 225, at 89–90; E. Ostrom, *Beyond Markets and States*, *supra* note 21, at 653.

263. E. Ostrom, *Beyond Markets and States*, *supra* note 21, at 653.

264. THE ECON. SCI. PRIZE COMM. OF THE ROYAL SWEDISH ACAD. OF SCI., *supra* note 205, at 12 (quoting ELINOR OSTROM, *UNDERSTANDING INSTITUTIONAL DIVERSITY* 267 (2005)).

265. See Dietz, Ostrom & Stern, *supra* note 229, at 1907 (applying local governance principles to the global problem of ozone layer depletion and other global environmental issues). See generally LOCAL COMMONS, *supra* note 228, at 23 (reporting "on an investigation of connections, previously unexplored, between issues involving local and global commons").

266. THE ECON. SCI. PRIZE COMM. OF THE ROYAL SWEDISH ACAD. OF SCI., *supra* note 205, at 2.

267. E. Ostrom, *Beyond Markets and States*, *supra* note 21, at 653.

Rules clearly define who has what entitlement: “boundaries between legitimate users and nonusers” and boundaries of the CPR.²⁶⁸

Users’ rights and responsibilities stand in reasonable proportion to their benefits and local conditions.

Most of those affected “by a resource regime are authorized to participate in making and modifying” the rules of the regime.²⁶⁹

Monitoring and sanctioning are carried out either by the users themselves or by someone who is accountable to the users.

Sanctions for rule violations are graduated: they “start very low but become stronger if a user repeatedly violates a rule.”²⁷⁰

Rapid, low cost, local dispute resolution mechanisms are in place to resolve conflicts among users or with officials.

“Minimal Recognition of Rights: The rights of local users to make their own rules are recognized by the government” (an outside authority).²⁷¹

Nested Enterprises: When a CPR resource is closely connected to a larger social-ecological system, “governance activities are organized in multiple nested layers.”²⁷²

Elinor Ostrom’s ‘design principles’ for robust governance systems should be taken into consideration in the evolution of space governance. A governance center will meet the design principles, and therefore be more likely to succeed, if (i) there is a clear definition or delineation of the sub-issue-area and of each user’s entitlements; (ii) users’ rights and responsibilities are in proportion to their benefits and local conditions; (iii) most users are allowed to participate in the making of the rules; (iv) monitoring and sanctioning are carried out by the users themselves or by someone who is accountable to the users, i.e., by or within the governance center; (v) sanctions are graduated; (vi) there is a dispute-resolution mechanism; (vii) the right of users to self-organize is clearly recognized by outside authorities (in this case there are no outside authori-

268. *Id.*

269. *Id.*

270. *Id.*

271. *Id.*

272. *Id.*

ties, due to the anarchy in international relations, but a recognition by UN-COPUOS would be productive); and (viii) the governance center is nested within the larger governance system (in this case, space governance and its main institution, UN-COPUOS). Naturally, these principles need to be adjusted to the context and perhaps not all can be fully applied, but each governance center should strive to meet them to the degree possible and considering specific conditions of the issue and governance center.

ii. *Institutional Deference*

Partial overlap is integral to polycentric governance, as it is to regime complexes and fragmentation. International *fora* and organizations partially overlap in their jurisdiction. This is particularly the case where there are several *fora* on a single issue-area. Overlap can exist between the respective jurisdictions of multilateral and regional forums, of intergovernmental forums with industry forums and so forth. In addition, the various instruments introduced by the many governance centers may partially overlap and occasionally conflict. While this may be a price worth paying, as suggested above, in view of the benefits of decentralized governance, the potential conflict between overlapping *fora* and instruments can be mitigated.

Pratt conceptualized the practice of ‘institutional deference’, where one international organization accepts another international organization’s exercise of authority on specific issues and by that “mitigate rule conflict and facilitate a division of labor within [a] regime complex.”²⁷³ This is a form of inter-institutional coordination that can be practiced in the case of space governance. UNOOSA already promotes inter-institutional cooperation and can facilitate this type of coordination.

Analyzing an original data set of over 2,000 policy documents from international organizations, Pratt found evidence that institutional deference is “a strategic act that is shaped both by efficiency concerns and power politics,” and that it is associated with division of labor, as “[international organizations] that defer to each other are more likely to focus their rule-making efforts on separate subissues.”²⁷⁴ Pratt also

273. Pratt, *supra* note 32, at 561.

274. *Id.*

demonstrated that deference is used to efficiently pool resources among disparate organizations.²⁷⁵

There are several practices that can be regarded as institutional deference. An institution or forum may adopt a set of rules established by a different institution as is, or it may alter its own conduct and operations so to confirm to such a set of rules.

Deference is a tool to manage jurisdictional overlap and inconsistencies in international rules. If various governance centers practice institutional deference, it will further alleviate the adverse effects of decentralized governance, as it will reduce the redundancy and inconsistency inherent in conflicting rules and jurisdictions. Institutional deference also supports polycentric governance's division of labor, as the point of the governance centers is to focus their rulemaking and potential monitoring efforts on separate sub-issue-areas. Intergovernmental organizations can adopt industry standards and multilateral forums, as UN-COPUOS can adopt a set of rules introduced by another forum (as it did in the case of the Space Debris Mitigation Guidelines).²⁷⁶

iii. *Standards for Decentralized Governance*

Polycentric governance provides a feasible way to develop space governance and can prove to be efficient, as it is built in large part on the key role of stakeholders. At the same time, it raises concerns of a democratic deficit,²⁷⁷ and regulatory oversight deficit.²⁷⁸ Specifically, it raises questions of participation, accountability. There are concerns over imbalance of power between the various actors (States and non-States alike), and preservation of the historical dominance of powerful States.

275. *Id.* at 585–86.

276. United Nations Office for Outer Space Affairs, Space Debris Mitigation Guidelines of the United Nations Committee on the Peaceful Uses Of Outer Space, <https://perma.cc/94SU-7A5T> (last visited Nov. 7, 2021).

277. *E.g.*, Benvenisti & Downs, *The Empire's New Clothes*, *supra* note 16, at 625.

278. *E.g.*, Eyal Benvenisti & George W. Downs, *National Courts and Transnational Private Regulation*, in ENFORCEMENT OF TRANSNATIONAL REGULATION: ENSURING COMPLIANCE IN A GLOBAL WORLD 133 (Fabrizio Cafaggi ed., 2012).

The work of Kingsbury, Stewart, Krisch and others on ‘global administrative law’ (GAL)²⁷⁹ and Benvenisti’s work on the “law of global governance”²⁸⁰ provide modern standards for global administration that may be applied in and across the various governance centers and thus minimize the above concerns. GAL provides for the accountability of global administrative bodies, and ensures they meet “adequate standards of transparency, participation, reasoned decision, and legality.”²⁸¹ Benvenisti uses a different terminology, but in his discussion on the ‘law of global governance’ he reaches similar conclusions: he suggests that global governance bodies should be subjected to procedural and substantive legal constraints, similar to those imposed by domestic administrative laws. Benvenisti further suggests that there is an emerging web of such global norms, and that they enhance the legitimacy of the global bodies.

While polycentric governance may evolve spontaneously (as it arguably already evolving in the case of space governance), GAL and/or the law of global governance can provide the tools to ensure space governance meets adequate standards in terms of, inter alia, participation and accountability. This idea, however, requires further study elsewhere, as this paper does not thoroughly examine the potential to apply GAL and/or the law of global governance to polycentric governance, in general, nor to space governance, in particular, and neither the expected results from such an application.

VI. CONCLUSION

The initial efforts of building space governance were successful in introducing basic norms, several widely accepted space law treaties and dedicated U.N. organs. However, this fairly monocentric system, in which UN-COPUOS is mandated with creating and expanding the *corpus juris spatialis*, reached an impasse culminating in a decades-long gridlock and the failure to introduce new legally binding regimes. As a result, space law fails to properly and effectively address even the most pressing challenges in space.

279. E.g., Kingsbury, *supra* note 33, at 23; Kingsbury, Krisch & Stewart, *supra* note 33, at 15–20.

280. E.g., EYAL BENVENISTI, LAW OF GLOBAL GOVERNANCE (2014).

281. Kingsbury, Krisch & Stewart, *supra* note 33, at 17.

In the current 'second era' of space quest, we sit on the verge of expanding human boundaries with commercial spaceflights, space tourism and manufacturing and extra-terrestrial habitats. Therefore, in this 'second era,' up-to-date, adequate governance is necessary to facilitate technological and commercial development, and the flow of economic and social benefits thereof for humankind.

This paper suggests that a polycentric system of governance will produce better results and enable the continuous evolution of space governance, so it can meet the ever-changing challenges and opportunities of space exploration and exploitation. A set of independent governance centers, loosely interconnected, is feasible and even more efficient than centralized governance. There are also identifiable ways to maximize the advantages of polycentric governance and to mitigate its adverse effects.

Polycentric space governance entails, in practice, that each sub-issue-area will have a separate issue-area-specific forum(s), led by stakeholders and experts, with the active participation of UNOOSA. Each governance center will introduce and modify rules and possibly monitor their application. These governance centers will be led by the stakeholders and experts that are best suited, in terms of knowledge and incentives, to introduce governance mechanisms. The basic building blocks of space governance—the space law treaties and U.N. organs—will remain; The governance centers will be an additional layer of institutionalization that promotes space governance. This is expected to break the gridlock and lead to the introduction of rules that are better suited to the circumstances, and more likely to be followed, than rules imposed from the top-down. Space governance will be the sum of the diverse governance centers and the interactions in and between themselves, and with the U.N. organs. Fortunately, Space governance is already on track to become increasingly polycentric, as stakeholders and experts establish forums that suggest, adopt or push for rules and standards. But, further action and (re)cognition is needed. In terms of policy recommendations, this paper suggests completely embracing polycentric governance, facilitating the establishment of governance centers and acknowledging their importance and output. It further suggests diverting more governance-building ef-

forts in this direction, while working to mitigate its adverse effects.

Polycentric governance will allow the flexible, incremental evolution of space governance. It will allow the establishment of partial regimes, where an attempt for a comprehensive regime fails, and it will permit cooperation among actors in some areas, despite their disagreements in other areas. The aggregate of all these new instruments and forums, created to address specific issues in space governance, will be a more comprehensive, flexible, and updated governance system, than a monocentric model of global governance could yield. This flexibility is particularly important in issue-areas with high uncertainty, or fast or frequent changes emanating from technological development and changes in global geopolitics. Space activities are just such an issue-area. All told, the merits of polycentric governance are not limited to space activities and the conclusions of this paper may therefore suit other issue-areas in global affairs, and global affairs in general.

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APPENDIX - ABBREVIATIONS

APSCO - The Asia-Pacific Space Cooperation Organization

ASAT - Anti-Satellite Weapons

ATS - Antarctic Treaty System

BCE - Before Common Era

CD - Conference on Disarmament

CPRs - Common-pool Resources

ECSL - European Centre for Space Law

ESA - European Space Agency

ESPI –European Space Policy Institute

EU –European Union

G7 - The Group of Seven

GAL - Global Administrative Law

GEO - The Intergovernmental Group on Earth Observations

GNSS - Global Navigation Satellite Systems

GPS - Global Positioning System

IAASS - International Association for the Advancement of Space Safety

IAD - Institutional Analysis and Development

IADC - Inter-Agency Space Debris Coordination Committee

ICAO - International Civil Aviation Organization

ICG - The International Committee on Global Navigation Satellite Systems

ICJ - International Court of Justice

IOs - International Organizations

IR - International Relations

ISS –International Space Station

ITU - International Telecommunication Union
MILAMOS - Manual on International Law Applicable to military Uses of Outer Space
NASA - National Aeronautics and Space Administration
NGOs - Non-governmental Organization
NIE - New Institutional Economics
OECD - The Organization for Economic Co-operation and Development
OST - Outer Space Treaty
PTBT - Partial Test Ban Treaty
SSA - Space Situational Awareness
STM - Space Traffic Management
SWF - Secure World Foundation
UAE- United Arab Emirates
UK - United Kingdom
UN - United Nations
UN-COPUOS - United Nations Committee on the Peaceful Uses of Outer Space
UN-SPIDER - The United Nations Platform for Space-based Information for Disaster Management and Emergency Response
UNGA - United Nations General Assembly
UNIDIR - United Nations Institute for Disarmament Research
UNODA - United Nations Office for Disarmament Affairs
UNOOSA - UN Office for Outer Space Affairs
UNRCSSSTE – United Nations Regional Centers for Space Science and Technology Education
WTO - World Trade Organization