

Introduction: Undergoverned Spaces

Chapter One

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Introduction: Undergoverned Spaces

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This report explores challenges, concepts, and approaches for participating in long-term competition in undergoverned spaces (UGS). UGS characterize much of the world, yet they remain difficult to conceptualize and operate in. Through a series of essays, the authors of the chapters of this report take the first steps toward developing concepts of what UGS are, why and when they are strategically important, and how to improve the ability of the United States to engage in them.

Given the emphasis on exploring UGS as a concept, examining the implications of UGS, and identifying the potential strategies and supporting technologies to more effectively engage in UGS, we gave the authors wide latitude on how to define UGS, identify the interests and stakes involved, and articulate the challenges and needs for addressing UGS. Contributors were selected according to their specific expertise and experience in dealing with the different aspects of UGS—such as decisionmaking under uncertainty and multi-stakeholder coordination, strategic analysis, and overt and covert information collection. In addition, we sought broad perspectives on matters of technological research and development (R&D), national competitiveness, innovation, and adaptiveness that undergird effective participation in long-term competition.

This introduction briefly provides a working definition of governance, then discusses three central considerations that set the foundation on which the remaining chapters of this report build. We seek to raise provocative questions rather than offer definitive answers. Specifically, we discuss why UGS will remain difficult to define, the place of UGS in the context of U.S. national security, and the transition away from the joint phasing construct (JPC) toward the Act-Sense-Decide-Adapt (ASDA) cycle of adaptive campaigning for long-term competition.¹ We end this introduction by discussing the structure of the report, providing readers with a map of the major parts and chapters within them.

¹ On ASDA, see Joint Publication 3-0, *Joint Operations*, Washington, D.C.: U.S. Joint Chiefs of Staff, October 22, 2018. On JPC, see Head Modernisation and Strategic Planning—Army, *Army's Future Land Operating Concept*, Canberra, Australia: Australian Army Headquarters, 2009.

Defining Governance

In seeking to develop the concept of UGS, it is necessary to start with defining governance itself. This is not a simple task but serves as a useful starting point for understanding what is missing or deficient when determining whether something is undergoverned. As a starting point, governance will be defined in functional or institutional terms.

A functional or institutional view of governance considers how individuals within a system manage interdependence, or “the sum of the many ways individuals and institutions, public and private, manage their common affairs.”² Broadly, *governance* refers to the rules for coordinating behavior and managing conflicts established from the top down by formal authorities; norms that develop from the bottom up as a matter of practice; identities that prescribe the roles, rights, privileges, and obligations that actors have toward one another; and the shifting interpretations of these practices that occur over time—for example, the continual interpretation and reinterpretation of the U.S. Constitution.³ Questions that arise, then, deal with the substance of the rules; who participates in developing, changing, and enforcing them; and whether the rules facilitate behaviors, most notably exchanges of goods, services, information, and more, that would otherwise not occur in their absence.⁴ These issues are further discussed in Chapters Two and Four.

Defining Undergoverned Spaces

Even with a definition of governance, UGS remain difficult to define. Efforts to provide a concise and clear definition with sharp contours that allow for uncontested categorization or quantification are unlikely to emerge. Nevertheless, examining what should be encompassed in the definition of UGS—what may be considered and what should be excluded—provides a useful point of departure, and later chapters in this report offer a richer investigation of these issues. Here, however, it is enough to note two important conceptual challenges. Any discussion of international relations and national security starts with the state as the point of departure, from which many questions proceed:

- Are relations between states governed by a higher authority or constrained by strong institutions?

² Commission on Global Governance, *Our Global Neighbourhood: The Report of the Commission on Global Governance*, Oxford: Oxford University Press, 1995, p. 2, quoted in Joyeeta Gupta, Hebe Verrest, and Rivke Jaffe, “Theorizing Government,” in Joyeeta Gupta, Karin Pfeffer, Hebe Verrest, and Mirjam Ros-Tonen, eds., *Geographies of Urban Governance: Advanced Theories, Methods and Practices*, Cham, Switzerland: Springer International Publishing, 2015.

³ John F. Padgett, “Evolvability of Organizations and Institutions,” in David S. Wilson and Alan Kirman, eds., *Complexity and Evolution: Toward a New Synthesis for Economics*, Cambridge, Mass.: MIT Press, 2016.

⁴ Douglass C. North, “Institutions,” *Journal of Economic Perspectives*, Vol. 5, No. 1, March 1991.

- Are states threatened by the actions of nonstate actors that operate outside national or international law?
- Are states governed in a fashion that produces ethical and effective decisions and actions?

Whether analysts are specifically interested in these questions or others, the workings and failures of the consolidated state serve as the frame of reference from which almost all assessments proceed. This is not to suggest that a state-centric view of international relations and security is always the most important framework (or even a relevant one) to consider, but it is almost always the one with which alternatives are compared.

The primacy of state-centric analysis carries with it the seeds of ambiguity that limit definitions of UGS. Specifically, because the state is an *unnatural kind*—a unit of analysis that does not exist outside human consciousness—it lacks an objective, independent basis in reality and thus remains contested.⁵ Whatever problems exist about defining the state as the central node of governance from which national and international order and stability emanate also affect any investigation into its weakness or absence.⁶

The focus on how governance occurs—i.e., the institutional perspective—allows for the shedding of much of the conceptual baggage inherited from state-centric models of governance.⁷ Broadened perspectives on management, policy, and security have encouraged increasingly functional perspectives on the purposes and mechanisms by which resources are allocated and exchanged within and between populations, and on how these facilitate or inhibit exchange. From this functional perspective, governance contains a broad variety of dimensions—notably the allocation, in the context of what both states and nonstate actors do, of rights, privileges, obligations, wealth, and services (such as health care, security, and justice).

These functional perspectives allow observers to identify (1) aspects of governance in areas that are outside the purview of traditional analyses of national security, such as the governance of markets and data, and (2) alternatives to the central role that coercion plays in the development, imposition, and enforcement of rules that govern exchange. In

⁵ Peter Godfrey-Smith, “Induction, Samples, and Kinds,” in Joseph Keim Campbell, Michael O’Rourke, and Matthew H. Slater, eds., *Carving Nature at Its Joints: Natural Kinds in Metaphysics and Science*, Cambridge, Mass.: MIT Press, 2011; Nancy Cartwright and Rosa Runhardt, “Measurement,” in Nancy Cartwright and Eleonora Montuschi, eds., *Philosophy of Social Science: A New Introduction*, New York: Oxford University Press, 2014.

⁶ Joel S. Migdal, *State in Society: Studying How States and Societies Transform and Constitute One Another*, New York: Cambridge University Press, 2001; Edgar Grande and Louis W. Pauly, eds., *Complex Sovereignty*, Toronto, Canada: University of Toronto Press, 2007; Christopher Pierson, *The Modern State*, 3rd ed., New York: Routledge, 2012.

⁷ Mark Bevir, *Governance: A Very Short Introduction*, illustrated ed., New York: Oxford University Press, 2012.

doing so, observers can also identify pathways from undergoverned to governed status (and back)—many of which exist outside the state or its alternatives.

The concept of undergovernance applies to the traditional domain of security at the domestic and international levels of analysis; the inner workings of complex organizations in which failures to coordinate inputs and outputs affect competitiveness in the production or consumption of goods, services, and information; and domains in which state and nonstate actors are on equal footing, as is increasingly the case in such digital domains as cyberspace. Thus, there are many ways in which a space may be considered undergoverned (see the text box).

Given definitional challenges discussed here and in subsequent chapters, this report has adopted a big-tent approach that has allowed the authors (and the interviewees whose perspectives are presented in Chapter Five) to develop and advance arguments based on their own views of the needs, challenges, and opportunities posed by UGS. Some chapters in this report take on the challenge of defining UGS, or at least offer criteria that would allow future research to proceed on firmer conceptual or empirical foundations. Other chapters employ instrumentally useful definitions that allow for the advancement of specific arguments about science and technology, planning and strategy, and engagement in ways that would improve U.S. competitiveness regardless of the ways in which specific definitions of UGS might evolve. The result is that definitions of UGS remain a work in progress, awaiting future study to be honed into a reliable analytic concept.

Types of Undergovernedness

Undergovernedness Between States

- Disregard for international law, institutions, or norms
- Development of competing governance institutions and norms
- Obsolescence of international institutions and norms
- Emergence of new domains of competitive interaction and conflict

Undergovernedness Within States

- Openly contested governance within a state
- Divided governance within a state
- Malgovernance or kleptocracies that are unconstrained in the pursuit of private interests
- Underperformance of governance

Undergovernedness Outside States

- Inability to enforce agreements
- Inability to attribute actions
- Inability to regulate actions

UGS and National Security

The 2017 National Security Strategy (NSS) and 2018 National Defense Strategy (NDS) have each placed long-term competition with strategic rivals at the forefront of national security and military planning.⁸ As the NDS stated:

The central challenge to U.S. prosperity and security is the reemergence of long-term, strategic competition by what the [NSS] classifies as revisionist powers. It is increasingly clear that China and Russia want to shape a world consistent with their authoritarian model—gaining veto authority over other nations’ economic, diplomatic, and security decisions.⁹

For many, achieving the vision set forward in the NSS and NDS requires shifting attention away from weak, failing, and failed states; nonstate actors; and the stresses caused by technological and climate change, instead directing attention toward enduring and defeating the nation’s most capable rivals—Russia and China—in direct political competition and military conflict. The result is a return to great-power politics and a balance-of-power approach to dealing with the world’s most formidable and consolidated governments—a far cry from the challenges posed by state weakness.

Such a characterization is misleading for several reasons. First, the notion that engaging in UGS constitutes an alternative to great-power conflict mischaracterizes the conduct of long-term competition between great powers. As numerous historians have noted, the Cold War—the last protracted great-power competition—may have been waged over the political influence and security of postwar Europe, but its hot conflicts were fought in Asia, Africa, and Central and South America, with Korea, Cuba, Vietnam, Angola, and Afghanistan providing a few prominent examples.¹⁰ Contemporary challenges posed by gray-zone

⁸ White House, *National Security Strategy of the United States of America*, Washington, D.C., 2017; U.S. Department of Defense, *Summary of the National Defense Strategy of the United States of America: Sharpening the American Military’s Competitive Edge*, Washington, D.C., 2018.

⁹ U.S. Department of Defense, 2018, p. 2.

¹⁰ John Lewis Gaddis, *We Now Know: Rethinking Cold War History*, reprint ed., New York: Oxford University Press, 1998; John Lewis Gaddis, *The Cold War: A New History*, New York: Penguin Press, 2005; Robert McMahon, *The Cold War: A Very Short Introduction*, New York: Oxford University Press, 2011; Odd Arne Westad, *The Global Cold War*, New York: Cambridge University Press, 2011; Odd Arne Westad, *The Cold War: A World History*, New York: Basic Books, 2019.

conflict,¹¹ hybrid warfare,¹² New-Generation Warfare,¹³ virtual societal warfare,¹⁴ and more suggest that great-power rivalries have given rise to a new Great Game, in which the great powers compete for control over territory, access to resources and markets, and international influence on a global scale.¹⁵

Second, the NDS also identified broad U.S. interest in preserving the rules-based international order, which forms the backbone of international prosperity and security. It noted that this order is weakening and facing challenges by actors that simultaneously seek to reap rewards from the security and opportunities its institutions provide while undercutting their principles.¹⁶ As John Ikenberry, one of the most forceful proponents of the international order, noted:

¹¹ Philip Kapusta, "The Gray Zone," *Special Warfare*, Vol. 28, No. 4, December 2015; Michael J. Mazarr, *Mastering the Gray Zone: Understanding a Changing Era of Conflict*, Carlisle, Pa.: U.S. Army War College Press, 2015; Antullio Echevarria II, *Operating in the Gray Zone: An Alternative Paradigm for U.S. Military Strategy*, Carlisle, Pa.: U.S. Army War College Press, 2016; James J. Wirtz, "Life in the 'Gray Zone': Observations for Contemporary Strategists," *Defense & Security Analysis*, Vol. 33, No. 2, April 3, 2017; Dani Belo, "Conflict in the Absence of War: A Comparative Analysis of China and Russia Engagement in Gray Zone Conflicts," *Canadian Foreign Policy Journal*, Vol. 26, No. 1, July 29, 2019; Lyle J. Morris, Michael J. Mazarr, Jeffrey W. Hornung, Stephanie Pezard, Anika Binnendijk, and Marta Kepe, *Gaining Competitive Advantage in the Gray Zone: Social Manipulation in a Changing Information Environment*, Santa Monica, Calif.: RAND Corporation, RR-2714-OSD, 2019; Ben Connable, Stephanie Young, Stephanie Pezard, Andrew Radin, Raphael S. Cohen, Katya Migacheva, and James Sladden, *Russia's Hostile Measures: Combating Russian Gray Zone Aggression Against NATO in the Contact, Blunt, and Surge Layers of Competition*, Santa Monica, Calif.: RAND Corporation, RR-2539-A, 2020; Geraint Hughes, "War in the Grey Zone: Historical Reflections and Contemporary Implications," *Survival*, Vol. 62, No. 3, May 3, 2020.

¹² Williamson Murray and Peter R. Mansoor, eds., *Hybrid Warfare: Fighting Complex Opponents from the Ancient World to the Present*, New York: Cambridge University Press, 2012; Christopher Paul, "Confessions of a Hybrid Warfare Skeptic," *Small Wars Journal*, March 3, 2016; Christopher S. Chivvis, "Understanding Russian 'Hybrid Warfare': And What Can Be Done About It," testimony presented before the House Armed Services Committee on March 22, 2017, Santa Monica, Calif.: RAND Corporation, CT-486, 2017; Chiyuki Aoi, Madoka Futamura, and Alessio Patalano, "Introduction: 'Hybrid Warfare in Asia: Its Meaning and Shape,'" *Pacific Review*, No. 31, Vol. 6, November 2, 2018; Joshua Stowell, "What Is Hybrid Warfare? Non-Linear Combat in the 21st Century," *Global Security Review*, blog post, August 1, 2018.

¹³ Jānis Bērziņš, "The New Generation of Russian Warfare," *Aspen Review*, March 15, 2017; Jānis Bērziņš, "The Theory and Practice of New Generation Warfare: The Case of Ukraine and Syria," *Journal of Slavic Military Studies*, Vol. 33, No. 3, July 2, 2020; Nicholas Fedyk, "Russian 'New Generation' Warfare: Theory, Practice, and Lessons for U.S. Strategists," *Small Wars Journal*, March 4, 2017; Phillip Karber, "Russia's New Generation Warfare," National Geospatial Intelligence Agency, June 4, 2015; Phillip Karber and Joshua Thibeault, "Russia's New-Generation Warfare," Association of the United States Army, May 20, 2016; Herbert R. McMaster, *Battlegrounds: The Fight to Defend the Free World*, New York: Harper, 2020.

¹⁴ Michael J. Mazarr, Ryan Michael Bauer, Abigail Casey, Sarah Heintz, and Luke J. Matthews, *The Emerging Risk of Virtual Societal Warfare: Social Manipulation in a Changing Information Environment*, Santa Monica, Calif.: RAND Corporation, RR-2714-OSD, 2019.

¹⁵ Peter Hopkirk, *The Great Game: The Struggle for Empire in Central Asia*, New York: Kodansha USA, 1992.

¹⁶ U.S. Department of Defense, 2018, p. 2.

Great powers—China and Russia—are offering forceful illiberal challenges to the Western liberal order. Equally profound challenges are coming from within the liberal democratic world itself—reactionary nationalism, populist authoritarianism, and attacks on openness and the rule of law.¹⁷

Central to international order is the belief that the construction, maintenance, and modification of international institutions are not an alternative to balance-of-power politics;¹⁸ rather, defining and enforcing their prescriptions and prohibitions serve as a venue for conducting balance-of-power politics.¹⁹ Thus, the United States faces the challenge of determining when to bolster, reform, rebuild, or abandon the complex web of international institutions that form the spine of the international order.²⁰

Third, the NSS does not focus exclusively on great-power competition. It notes the continued need to pursue threats to their sources, such as terror groups and criminal organizations. This requires maintaining capabilities to monitor, influence, and project power into areas governed by states that are unwilling or unable to fulfill their obligations to prevent attacks emanating from their physical or virtual territory. By implication, then, the NSS accepts that the United States will continue to be threatened by regional powers and nonstate actors; the United States requires the ability to counter and project power against aggressors.

Viewed together, shifts in emphasis toward great-power rivalries with Russia and China could alter the logic of interventions into UGS, but they do not eliminate demand for doing so. Conflicts in Syria, the South China Sea, the Arctic, the cyber world, and elsewhere will all continue to demand the attention of the United States regardless of what Russia or China might do.

Therefore, a pragmatic consideration of UGS and their place in national security policy and strategy is warranted. Specifically, the features of UGS in terms of their connectivity with national security priorities and governance institutions (be they international, national, corporate, or nonstate) might provide the best arguments for engaging or abstaining within UGS. Considerations and consequences that motivate engaging within UGS are presented in the related text box and discussed in greater detail in Chapter Three.

¹⁷ G. John Ikenberry, *A World Safe for Democracy: Liberal Internationalism and the Crises of Global Order*, New Haven, Conn.: Yale University Press, 2020, p. xii.

¹⁸ In the study of international governance, *institutions* is an overloaded term whose meaning varies based on context. It refers to formal organizations (United Nations and World Trade Organization); international laws (International Law of the Sea Convention); codified treaties, regimes, accords, agreements, covenants, and conventions (Strategic Arms Limitation Treaty, Missile Technology Control Regime, Helsinki Accords, Paris Agreement, International Covenant on Civil and Political Rights, Chemical Weapons Convention); and informal norms (territorial integrity, noninterference, responsibility to protect). See Padgett, 2016.

¹⁹ G. John Ikenberry, *After Victory: Institutions, Strategic Restraint, and the Rebuilding of Order After Major Wars*, Princeton, N.J.: Princeton University Press, 2000.

²⁰ Jeff D. Colgan and Robert O. Keohane, “The Liberal Order Is Rigged: Fix It Now or Watch It Wither,” *Foreign Affairs*, Vol. 96, No. 3, May/June 2017; Ikenberry, 2020.

Considerations for Competing in Undergoverned Spaces

Consideration	Consequence
Increasing numbers of actors capable of entering and competing in a given space	Increased complexity resulting from heterogeneous goals and capabilities of competitors
Limited presence or weakness of existing governance institutions within a space	Risks of undermining established governance institutions, whether formal rules, such as internal law, or informal norms of behavior that make actors less predictable
Dependencies on governance institutions in other spaces	Risks posed to undermining governance institutions on which stable and managed behaviors in other spaces rely
The need to cope with novelty and uncertainty in an open-ended system	A continuous demand for shifting organizational designs and decisionmaking processes to adapt to changes in the composition of the space and the behaviors and capabilities of the actors within it

New Approaches for Engagement

The JPC has served as the backbone for U.S. Department of Defense (DoD) planning and engagement since the mid-2000s and presents a cyclical model that divides relations between states into phases labeled Phase 0 through Phase V (Figure 1.1). Shortly after its codification, critics noted that the model had several organizational and conceptual artifacts (discussed in Chapter Six) that limited its effectiveness in practice.

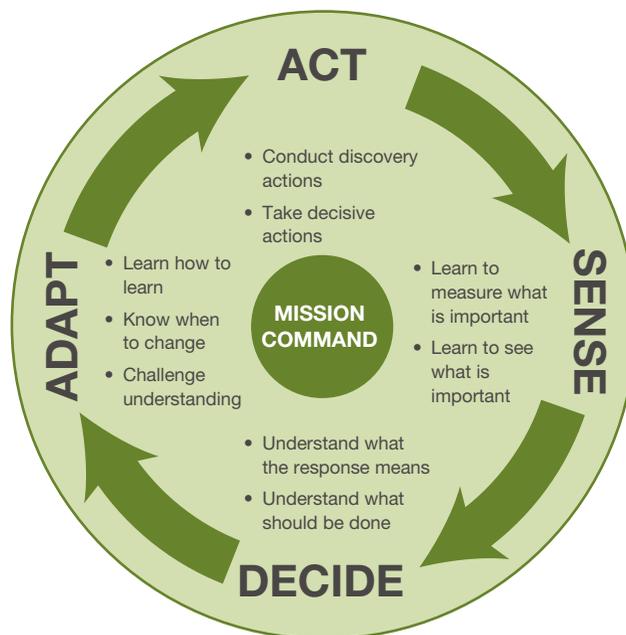
A recent alternative for planning engagements in the international system was developed as part of a model of adaptive campaigning.²¹ This model adopts a complex adaptive systems approach to engagement, seeing military forces as embedded in the environment, not standing separate from it.²² In this model, organizations compete for a better understanding of the environment and the opportunity to shape it through the performance of the ASDA cycle (Figure 1.2).

Whereas the JPC imagines a cyclic pattern of conflict, suggesting that military conflict might be an inevitable step in the relations between competitors and therefore encouraging a race to achieve a decisive advantage, the ASDA cycle is more flexible and reflexive, demanding that organizations continuously reevaluate their beliefs about their positions in the system and relations with others. This does not preclude the possibility of conflict and violence, but it does allow that parties could learn how to maintain a contentious relationship beneath thresholds that would trigger a movement into Phase II or III of the JPC and could even seek mutually beneficial, cooperative relations.

²¹ Head Modernisation and Strategic Planning—Army, 2009; Michael Bassingthwaighe, *Adaptive Campaigning Applied: Australian Army Operations in Iraq and Afghanistan*, Fort Leavenworth, Kan.: School of Advanced Military Studies, United States Army Command and General Staff College, 2010.

²² Head Modernisation and Strategic Planning—Army, 2009; Justin Kelly and Mike Brennan, “OODA Versus ASDA: Metaphors at War,” *Australian Army Journal*, Vol. 6, No. 3, Summer 2009.

FIGURE 1.2
The ASDA Cycle



SOURCE: Head Modernisation and Strategic Planning—Army, *Army's Future Land Operating Concept*, 2009, p. 31. Used with permission.

A Journey Through Undergoverned Spaces

The chapters in this report build on three key considerations:

1. What are UGS?
2. Why should they be engaged in?
3. How can that be done more effectively?

The authors have extended these questions to discuss the investments that sponsors of scientific, technical, and organizational R&D should consider in enhancing DoD's competitiveness and adaptability. They were encouraged to address issues of UGS on their own terms and asked to draw on their experience, expertise, and imagination to answer how to make the United States more competitive and adaptive in long-term competition, acknowledging that bringing governance to where undergovernance exists may not be easy, fast, or even possible. Many authors were asked to consider the challenge of enduring infinite games or brawls rather than achieving well-defined end states,²³ and all were asked to consider the ASDA

²³ James P. Carse, *Finite and Infinite Games*, New York: The Free Press, 1986; Simon Sinek, *The Infinite Game*, New York: Portfolio, 2019; George Skaff Elias, Richard Garfield, and K. Robert Gutschera, *Characteristics of Games*, Cambridge, Mass.: MIT Press, 2012.

cycle of adaptive campaigning as a template for organizing the broad variety of investments that may yield new capabilities.²⁴

The result is a set of 18 chapters broadly grouped in four parts, as shown in Table 1.1. Collectively, these chapters provide initial speculations into the concept of UGS, the strategic problems they pose, and the prospects for investments in science and technology to provide meaningful capabilities to enhance U.S. competitiveness and security. Together, these chapters offer new perspectives for engaging in long-term competition in which adaptation will be a crucial strategic capability.

Part One: Perspectives on Undergoverned Spaces

The first part of this report, Chapters Two through Six, provides an extended discussion of the UGS concept and the demands for engaging in UGS. These chapters offer a variety of perspectives taken from the diverse expertise and experiences of the authors. The authors of these chapters were specifically asked to look at the theoretical and practical problems of defining and engaging in UGS from a diagnostic perspective; i.e., to present a body of experience and concepts that shed light on the challenges posed by UGS without specific demands for offering solutions, though each identifies promising paths. Together, these chapters address theoretical, empirical issues associated with defining UGS and the practical demands of engaging in them.

In Chapter Two, **Aaron B. Frank** examines the prospect of developing a formal definition of UGS and examines the many ways that spaces can be undergoverned. In doing so, he identifies how UGS might threaten national security and offers a set of considerations that policymakers and military planners should think about when determining whether the approaches to planning and engagement described in this report should be pursued in lieu of more-conventional methods and processes.

In Chapter Three, **Adam R. Grissom** explores the puzzle of DoD's historically unimpressive performance in UGS, finding that the fundamental challenge may be analytical in nature. He describes DoD's apparent weaknesses in accurately perceiving complex and informal social, political, economic, and military dynamics in UGS, and he concludes that new analytical methods are required to allow DoD to develop the improved understanding necessary to achieve better operational and strategic results.

In Chapter Four, **Jonathan S. Blake** examines the concept of UGS through the lens of contemporary theories and empirical models of governance. He notes that before determining whether an area or issue is undergoverned (a quantitative notion), it is necessary to first understand qualitative properties about who governs and how. He notes that the international system is rife with examples of functional governance that only appear undergoverned if the state and the provision of governmental goods and services are conflated. Instead, he notes that alternative governance is a necessary concept that allows broad and unconven-

²⁴ Head Modernisation and Strategic Planning—Army, 2009.

TABLE 1.1
Authors, Parts, and Chapter Titles and Numbers

Author(s)	Chapter Title	Chapter Number
Part One: Perspectives on Undergoverned Spaces		
Aaron B. Frank	Undergoverned Spaces: Problems and Prospects for a Working Definition	Two
Adam R. Grissom	Undergoverned Spaces and the Challenges of Complex Infinite Competition	Three
Jonathan S. Blake	Perspectives on State Governance, Undergovernance, and Alternative Governance	Four
Gabrielle Tarini and Kelly Elizabeth Eusebi	Adaptation, Complexity, and Long-Term Competition in UGS: Perspectives from Policymakers and Technologists	Five
Aaron B. Frank	Building Strategies for Long-Term Competition: Infinite Games and Adaptive Planning	Six
Part Two: (Social) Science Investments for Undergoverned Spaces		
Joseph N. Mait	Science and Technology Planning for the Future—Operating in Three Realms	Seven
Andrew M. Parker	The Need to Invest in Social Science Infrastructure to Address Emerging Crises	Eight
Elisa Jayne Bienenstock	Operationalizing Social Science for National Security	Nine
Edward Geist	Why Reasoning Under Uncertainty Is Hard for Both Machines and People—and an Approach to Address the Problem	Ten
Part Three: Supporting Long-Term Planning in the Face of Uncertainty and Change		
Steven W. Popper	Designing a Robust Decision–Based National Security Policy Process: Strategic Choices for Uncertain Times	Eleven
Paul K. Davis	Toward an Analytic Architecture to Aid Adaptive Strategy for Competing in Undergoverned Spaces	Twelve
Robert J. Lempert, Kelly Klima, and Sara Turner	Multi-Stakeholder Research and Analysis for Collective Action in Undergoverned Spaces	Thirteen
Part Four: Centering Decisions in Analysis for Adaptation and Competition		
Zev Winkelman	Using Technology to Improve the Agility of Force Generation Processes	Fourteen
Ben Connable	Authentically Describing and Forecasting Human Behavior for Policy Analysis: A Review and a Path Forward	Fifteen
Robert L. Axtell	Short-Term Opportunities, Medium-Run Bottlenecks, and Long-Time Barriers to Progress in the Evolution of an Agent-Based Social Science	Sixteen
Justin Grana	Difficulties in Analyzing Strategic Interaction: Quantifying Complexity	Seventeen
James R. Watson, Michael J. Gaines, and Aaron B. Frank	Evolving Security: Societal Immunity and Competing Demons or Cooperating Angels	Eighteen
Elizabeth M. Bartels, Aaron B. Frank, Jasmin Léveillé, Timothy Marler, and Yuna Huh Wong	Gaming Undergoverned Spaces: Emerging Approaches for Complex National Security Policy Problems	Nineteen

tional arrangements on how resources are allocated within societies and that alternative governance is a necessary component of any operational definition of UGS.

In Chapter Five, **Gabrielle Tarini** and **Kelly Elizabeth Eusebi** provide insights based on a set of 33 semistructured interviews with policymakers, academic researchers, and technologists. In these interviews, a diverse group of experts were asked to identify challenges and opportunities for DoD and the National Security Enterprise (NSE) to improve adaptability and ability to succeed in long-term competition. Interviewees identified many barriers to success, starting from the fact that UGS have traditionally been low-priority environments and efforts to engage in them have therefore been hampered by numerous challenges, such as limited and inconsistent access to resources, limited and often low-quality information and intelligence, and missing analytic capabilities tailored to exploring the space of the possible and the mitigation of risks (as opposed to increasing the efficiency of resource allocations). Likewise, the authors identified several opportunities to increase the competitive and adaptive capabilities of the United States and its national security organizations. Among these opportunities are multiple investments—spanning computational tools to organizational designs and incentives—that share a common purpose: sustained commitments to exploration and discovery of new frameworks for understanding the environment and solutions for problems within it.

In Chapter Six, **Aaron B. Frank** continues the previous discussion on the shortcomings of the JPC and examines a set of concepts that might better serve the needs of long-term competition in UGS: the notion of infinite games; the ASDA cycle; problem-centric government; adaptive governance; and differentiating among hierarchies, markets, and networks as alternative modes of governance.

Part Two: (Social) Science Investments for Undergoverned Spaces

The second part of this report examines how investments in scientific research, most notably social science and social scientists, can support the development of the knowledge and capabilities to improve engagements in UGS. These four chapters (Seven through Ten) provide an interrelated set of perspectives on scientific research and the ability to develop technologies that would enable a better basis for understanding and engaging in UGS. Those perspectives involve considering the design of scientific research programs, looking at the development of the infrastructure to support more-effective social science research, improving the conduct of social science research in service of DoD, and ultimately exploring how research into artificial intelligence (AI) would need to proceed to create a basis for supporting decisionmaking under uncertain, adaptive, and open-ended conditions.

In Chapter Seven, **Joseph N. Mait** discusses the challenges posed by structuring research programs on complex subjects that increasingly meld elements from the physical, human, and cyber realms. Drawing on his experience as a researcher, program manager, and chief scientist at the Army Research Laboratory, he describes the basic organization of R&D programs in the physical and computational sciences and considers how increasing links between these sciences and the psychological and social sciences could affect program design, management,

and evaluation. He argues that although human-centric disciplines increase the complexity of research, the goal of research remains the same: to increase understanding through scientific study and to use that understanding to engineer systems and ultimately solve problems.

In Chapter Eight, **Andrew M. Parker** discusses the transformative potential of new research infrastructure for the social sciences. He notes that interest and resources in the social sciences do not materialize until a crisis has occurred, thus resulting in an explosive but uncoordinated demand for research. He provides several recommendations for how investments in research infrastructure could improve the ability for social scientists to support policymaking during crises by providing economic efficiencies, coordination of funding, and enhanced research collaboration through a variety of mechanisms that have proven successful in other domains. He notes, however, that the achievement of these outcomes depends on overcoming important challenges, such as institutional biases among research sponsors for investing in the physical sciences and the complexities of managing infrastructure to remain adaptive and sustainable over the long term.

In Chapter Nine, **Elisa Jayne Bienenstock** discusses fundamental principles of social science research and argues that DoD has consistently attempted to apply social science to specific and pressing issues prematurely. Echoing Parker, she argues that great investments in understanding the mundane general features of complex social systems are needed before the leap can be made to examining situationally specific research and applications. She recommends integrating scientific practices that emphasize the discovery and documentation of nomothetic features into DoD operations to improve the basis from which idiosyncratic properties can be identified and examined.

In Chapter Ten, **Edward Geist** examines the history of AI in strategic decisionmaking. By drawing on the history of AI's origins supporting the maintenance of the nuclear stalemate between the United States and Russia, he shows that promising research never matured to application because of the problems posed by uncertainty and continuously evolving capabilities. He further notes that while contemporary AI systems are built on a different foundation of problem representation and input data, the real-world consequences of uncertainty and its impact remain. He argues that, although task-specific AI has advanced, UGS are unlikely to present the strategic conditions for which these systems will flourish and that continued research into the handling of uncertainty and ambiguity remains a priority.

Part Three: Supporting Long-Term Planning in the Face of Uncertainty and Change

The third part, Chapters Eleven through Thirteen, presents several perspectives on planning and decisionmaking performed under uncertainty. These chapters examine the challenges posed by decisionmaking in complex, uncertain environments. The authors address the uncertainties posed by long-term competition and identify complementary pathways for achieving robust, adaptive strategies by emphasizing different features of strategic engagement—the flexibility of the planning system to cope with complexity, the flexibility

of models of complex systems, and the flexibility of decisionmaking processes to be open and involve multiple stakeholders that may serve as both the subjects and the consumers of analysis.

In Chapter Eleven, **Steven W. Popper** puts forward the proposition that for the NSE to operate effectively, the means for deliberating policies must also change. Processes need to be better suited to conditions of deep uncertainty where arguing over which assumptions about the future are correct will prove increasingly fruitless. Instead, the exploration of alternative assumptions (as well as narratives, causal explanations, and competing interests) should occur as part of the search for robust portfolios of actions—those tuned to yield satisfactory outcomes across a variety of potential futures. He argues that uncertainties should be characterized not by unknowable probabilities but in terms of reference framed around understanding the apparent choices; he also describes how adaptiveness should be made an integral feature of planning as opposed to being an ad hoc and ex post activity (as it often becomes). Importantly, he notes that such changes could further reposition the Intelligence Community to look more toward using its existing capabilities to provide decision support to the policy community while deemphasizing prediction and forecasting. He concludes by describing an alternative, computationally enabled, analytic, and deliberative policymaking process that is better suited than current approaches to produce robust and adaptive policy decisions.

In Chapter Twelve, **Paul K. Davis** argues that a new analytical architecture is needed to aid strategic planning for competing with great powers in UGS, specifically in the area of competition in which the rules that govern how powers deal directly with one another or their allies are increasingly contested, as in the case of the gray zone between the United States and its great-power rivals, Russia and China. Such planning must deal with developments in a complex adaptive system, so the analytical architecture needs to be conceived accordingly—a radical departure from the past. Analytic tools should help in (1) characterizing the nature of the system's state and the feasibility of influencing its development while (2) controlling risk and (3) evaluating the relative merits of alternative multilevel composite strategies that account for the behaviors of adversaries. The strategies should be reflected as portfolios of overt and covert political, military, and economic actions in different domains, levels of detail, and timescales. Some actions will prove successful, others ineffectual, and still others counterproductive. Thus, the architecture should anticipate timely but coherent adaptiveness. Adaptations might be modest adjustments, significant rebalancing of the portfolio, or major changes with revised objectives. One role of analysis will be to aid in planning for FARness—finding strategies that can be **F**lexible, **A**daptive, and **R**obust in allowing for changes of objective and mission, unexpected circumstances, and adverse events, respectively. Another role will be aiding actual strategic adaptations along the way.

In Chapter Thirteen, **Robert J. Lempert**, **Kelly Klima**, and **Sara Turner** provide an overview of how multiple stakeholders can be involved in the research process and consider how different types of involvement relate to one another. Given the openness of UGS, understanding how to engage with them and how to develop and maintain decisionmaking processes that scale as both the number of subjects and the number of participants increase

will be a feature of any effective engagement strategy. With this in mind, the authors focus on approaches that center stakeholders as either the focus of research or the coproducers of research and how each approach can add value for policymakers. The authors then examine each of these modalities in turn, identifying the general principles of practice, the different approaches that can be taken, and the tools that can be used in conducting research in these modalities, as well as the challenges of doing so. Finally, the authors examine future investments that could catalyze improvements in multi-stakeholder research, and they make the case for how these investments could drive improved multi-stakeholder governance.

Part Four: Centering Decisions in Analysis for Adaptation and Competition

The final part of this report explores emerging concepts and technologies that offer transformative opportunities for understanding and engaging in UGS. These chapters offer a variety of perspectives drawn from the R&D experiences of their authors. In each case, the authors focus on decisionmaking within complex systems, using such various methods as digital twins, Agent-Based Modeling (ABM), distributed computing, and gaming as techniques that can enable new ways of understanding and acting within UGS. In all cases, technical and methodological approaches are presented that place decisionmaking at the center of research and analysis. In some cases, the objectives are to create better representations of decisionmaking agents within systems, such as soldiers in the military or citizens within social networks and economic markets. In other cases, the objectives are to model decisionmaking processes to better understand and improve the processes themselves with the goal of increasing adaptability and competitiveness.

In Chapter Fourteen, **Zev Winkelman** adopts the unusual perspective that DoD is an undergoverned space in its own right, despite its size and scope. The basis of his argument is that the major decisions made along the path from generating military forces by the individual services to handing those forces over to the joint warfighting commands is simultaneously laden with the formal steps of the Planning, Programming, Budgeting, and Execution process and underspecified interfaces connecting them. As a result, transaction costs associated with supporting and participating in data collection, analysis, and conflict resolution among the multitude of stakeholders are high. He imagines how digital twin technologies used to monitor and simulate organizational processes might improve governance by adding transparency and speed to these large-scale, bureaucratic processes. Reducing the time and expense of these decisions might be one pathway for all of DoD to become more agile, more adaptive, and ultimately more competitive.

In Chapter Fifteen, **Ben Connable** discusses the trajectory of the RAND Corporation's Will-to-Fight research program. He notes that DoD's formal analytic tools that support threat assessment; force sizing; and planning at strategic, operational, and tactical levels underrepresent human motivations for fighting. In doing so, the department risks making serious errors. He argues for developing an integrated, computational model of individual behavior

that embeds individuals into groups and larger environmental context—a biopsychosocial model. Building on the work of systems theorists, he argues for a modeling strategy that is both expansive and modest—expansive in seeing the value of incorporating a variety of factors that could not be credibly omitted and modest in that, although building a computational model that is true is currently beyond the reach of science, the capabilities exist to build one that is useful and can be continuously improved.

In Chapter Sixteen, **Robert L. Axtell** describes the motivations for parallel execution of agent-based models, and he reviews rationales for large-scale ABM. These areas are two of the most important avenues for future progress of the field of ABM, which is arguably the most fertile new methodology in the social sciences in a generation—a kind of computationally enabled and data-driven social science. The possibility of automated synthesis of ABM from “big data” is discussed. Bottlenecks slowing progress are identified and possible barriers to accelerated progress are highlighted. Certain workarounds are suggested.

In Chapter Seventeen, **Justin Grana** examines the prospects of measuring the complexity of strategic interaction by using computational complexity. He determines that, although significant and important research has advanced algorithmic game theory and the characterization of computational-complexity classes, these approaches have not provided generalizable insights that can map game structures to the complexity of solutions and solution concepts. Instead, he argues that research shows that while game structures matter (e.g., whether games are zero sum or general sum, whether games are played as a single shot or repeated), idiosyncratic properties, such as the size of the game space, dominate the search for solutions. As a result, games that should be computationally tractable given their properties might actually require large commitments of computational resources to solve, while seemingly complicated games might be solved quickly and with relative ease.

In Chapter Eighteen, **James R. Watson, Michael J. Gaines, and Aaron B. Frank** explore the value of applying concepts from biological evolution and ecology to long-term competition. They specifically examine the application of the immune system as a model for defeating disinformation attacks on populations, extending the model’s application to the prevention of disease into more-speculative considerations of healing the body politic from infection. They also explore the implications of long-term competition between increasingly capable global powers through the lens of the Darwinian Demon, a theoretical organism imagined to be unconstrained by trade-offs in the adaptive trait space. Such examples serve to illustrate the richness and relevance of concepts that biological evolution and ecology can provide to national security, particularly with regard to adaptation and long-term competition.

In Chapter Nineteen, **Elizabeth M. Bartels, Aaron B. Frank, Jasmin Léveill  , Timothy Marler, and Yuna Huh Wong** examine the value of games as a tool for researching and exploring the complex, interactive dynamics of UGS. The authors argue that the games are a highly effective tool to help decisionmakers make sense of UGS because the games allow exploration of key elements in new problems and the relationships among those elements. The authors then explore the potential value of gaming in policymaking for UGS, describe two common failure modes for gaming of systems with high levels of complexity or indeterminacy, and offer several

approaches for improving games to explore these spaces. The chapter concludes with a vision for a new game concept—a contest arena—that combines advances in several areas that hold the potential to improve the ability of games to inform adaptive planning in UGS.

Reading This Report

This report is large, and readers are encouraged to follow their interests, sampling and skimming from the whole while more closely reading those chapters of greater interest and relevance to their needs. Each piece stands alone, and, although chapters are connected by common themes and interests, no efforts were made to coordinate responses to questions on UGS or encourage agreement or consensus. Thus, perspectives vary, which we believe is healthy and encouraging at such an early phase in research—indicating that there are both questions to be answered and opportunities to address them.

The chapters that follow, then, should be viewed for what they are—the first steps in a journey that we believe will benefit the nation’s security by providing new perspectives on UGS, long-term competition, and the capabilities to engage, endure, and ultimately thrive in an increasingly complex and interdependent international system.

Abbreviations

ABM	Agent-Based Modeling
AI	artificial intelligence
ASDA	Act-Sense-Decide-Adapt
DoD	U.S. Department of Defense
JPC	joint phasing construct
NDS	National Defense Strategy
NSE	National Security Enterprise
NSS	National Security Strategy
R&D	research and development
UGS	undergoverned spaces

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