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14. ABSTRACT This report summarizes the key findings of our Minerva-funded research project, its progress and findings. The research addressed engagement on climate change and energy security issues by DoD across various tiers and sectors of the organization. Specifically, a tripartite analysis investigated the relationships between strategy relating to the target issues, organizational and strategic culture, and relevant characteristics of the DoD organization, military services, and key subcomponents.					
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Report Title

Final Report: Strategic Response to Energy-related Security Threats

ABSTRACT

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Synthesizing the results of elite interviews, research into archival materials, budget materials, DoD documents, and other related governmental sources, the research provides a historically grounded and theoretically diverse introduction to the ways in which climate change discourse has influenced this vast and complex organization.

Major conclusions indicate that the issue of climate change, which is at heart a story about the dangers posed by the natural world to American interests and the fulfillment of American military and defense objectives, fits neatly into DoD culture, organization, and strategy. Thus our research challenges the perception that environmental security is divorced from the high politics of military security. Rather the threat of natural disasters and resource depletion has a history of salience within the defense establishment and climate change has thus been accommodated within this cultural milieu. However, the political baggage associated with the issue of climate, however, as well as its connection to other, less popular environmental programs, delayed the acceptance and integration of climate considerations into planning and strategy.

The study also found that the impressive current programs within DoD aimed at reducing petroleum consumption must be understood in light of earlier generations of policy aimed at addressing the costs associated with POL (petroleum, oil, and lubricants). The long history of U.S. energy consumption is encapsulated to a degree by DoD, and evidence for recurring cycles of engagement and disengagement on this issue illustrates that organizational learning theory may hold useful insights in further research and development in this arena.

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08/30/2013 1.00 Rebecca Pincus. Survey: resource footprints and environmental security at DoD installations, Dordrecht: Springer Science+Business Media, (01 2014)

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Rebecca Pincus	0.50	
FTE Equivalent:	0.50	
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Names of Post Doctorates

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Rebecca Pincus	0.63
FTE Equivalent:	0.63
Total Number:	1

Names of Faculty Supported

<u>NAME</u>	<u>PERCENT SUPPORTED</u>	National Academy Member
Saleem Ali	0.00	No
Asim Zia	0.00	
FTE Equivalent:	0.00	
Total Number:	2	

Names of Under Graduate students supported

<u>NAME</u>	<u>PERCENT SUPPORTED</u>	Discipline
Patrick Leous	0.00	Natural Resources
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Scientific Progress

Technology Transfer

Final Research Report: *Strategic Response to Energy-Related Security Threats in the US Department of Defense*

October 15, 2014

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1. Summary

This report summarizes the key findings of our Minerva-funded research project, its progress and findings. The research addressed engagement on climate change and energy security issues by DoD across various tiers and sectors of the organization. Specifically, a tripartite analysis investigated the relationships between strategy relating to the target issues, organizational and strategic culture, and relevant characteristics of the DoD organization, military services, and key subcomponents.

Synthesizing the results of elite interviews, research into archival materials, budget materials, DoD documents, and other related governmental sources, the research provides a historically grounded and theoretically diverse introduction to the ways in which climate change discourse has influenced this vast and complex organization.

Major conclusions indicate that the issue of climate change, which is at heart a story about the dangers posed by the natural world to American interests and the fulfillment of American military and defense objectives, fits neatly into DoD culture, organization, and strategy. Thus our research challenges the perception that environmental security is divorced from the high politics of military security. Rather the threat of natural disasters and resource depletion has a history of salience within the defense establishment and climate change has thus been accommodated within this cultural milieu. However, the political baggage associated with the issue of climate, however, as well as its connection to other, less popular environmental programs, delayed the acceptance and integration of climate considerations into planning and strategy.

The study also found that the impressive current programs within DoD aimed at reducing petroleum consumption must be understood in light of earlier generations of policy aimed at addressing the costs associated with POL (petroleum, oil, and lubricants). The long history of U.S. energy consumption is encapsulated to a degree by DoD, and evidence for recurring cycles of engagement and disengagement on this issue illustrates that organizational learning theory may hold useful insights in further research and development in this arena.

2. Problem Identification

The research proposal, as originally submitted to the Minerva program, grew from an interest in the response of the U.S. military to the interlinked, but very different, problems posed by dependence on petroleum products (or POL), and the emerging issue of climate change. Although not conventional military threats, these two issues severely complicate the practice of national defense, and raise questions about the organizational behavior, adaptability, and capacity for change of the Department of Defense.

These issues, of energy and climate, are currently in the policy spotlight due to high profile programs and favorable media attention. On the fourth page of the 2014 QDR, they both are linked to forward-oriented defense strategy:

The impacts of climate change may increase the frequency, scale, and complexity of future missions, including defense support to civil authorities, while at the same time undermining the capacity of our domestic installations to support training activities. Our actions to increase energy and water security, including investments in energy efficiency, new technologies, and renewable energy sources, will increase the resiliency of our installations and help mitigate these effects.¹

The research study was motivated by recognition of the apparently unstoppable momentum of programs related to energy and climate, and sought to assess whether these steps were taken with meaningful organizational commitment and durability of effort. DoD has been accused of “greenwashing”; were these programs open to such criticism? If DoD fully engaged on climate and energy issues, its position as an influential shaper of public opinion and industrial markets may enable larger impacts.

3. Approach

A. Research questions

The research proposal laid out objectives: “to determine *when*, *how*, and *why* DoD evolved new strategic priorities addressing energy and climate change.” In addition, the proposal aimed to “assess DoD capacity for change” and study “how the adoption of energy and climate change priorities can illustrate strengths and weaknesses in DoD organizational capacity.” On a larger scale, the research was designed to contribute to “an understanding of how DoD responds to changing security conditions, and how foreign national security institutions may respond to energy-related security threats.” These questions will be revisited in the “Conclusions” section of this report (Section 6), along with their answers.

To answer these questions, a three-layer analysis was proposed: combining analysis of organizational, cultural, and strategic factors to produce a fuller understanding of how DoD is engaging on energy and climate issues, and how these efforts may play out in the future. It is hoped that this analysis may prove a useful model for assessments of other key issues confronting DoD, as well as evaluations of foreign security institutions’ engagement on energy and climate.

B. Methods

Interview methods reflect the organizational culture approach outlined by Martin (1992)². Interviews were conducted by the research leader who had permission to undertake

¹ QDR 2014, Executive Summary, vi.

² Martin, 1992. 23-25.

conversations on these sensitive issues beforehand. Usually, only a single individual was interviewed at a time, but in the case of direct coworkers, sometimes two or three joined in a group discussion. These interviews were informal and open-ended. We encouraged respondents to talk about any aspect of their work, both current and especially historical, as well as to speculate about the future. Leading questions were minimized, instead probing for more information (“Can you tell me more?” “Anything else?”) if conversation lagged. As common issues, cultural manifestations, or areas of disagreement emerged across interviews, we began to ask questions related to those themes specifically in alignment with “grounded theory” analysis. Some interviews took place by phone, although the great majority were undertaken in-person. Many respondents expressed concerns about attribution, and were uncomfortable with recording devices. As a result, interviews were unrecorded. Extensive notes were taken and every effort was made to preserve each individual’s exact words when specific answers or phrases were critical. Many of the notes pertaining to basic information relied on paraphrases. When in any doubt about specific quotations, we checked back with original sources. Respondents were speaking of their personal experiences, and when they were willing to generalize about any part of the U.S. defense establishment or government, the descriptions reflected their own views. Thus the material reflects various assertions of ‘fact’ that were recorded, rather than checked against possibly more ‘authoritative’ sources. How these employees perceived the culture is informative, whether or not others would agree with their perceptions. We note disagreements in perception and interpretation.

Interviews were put into context with analysis of DoD publications, reports, policy statements, and other documents. In addition, archival research produced materials from presidential, Congressional, and other government sources that illuminated DoD policies. Data on DoD spending related to energy and climate issues was also explored. Content analysis of documents, both current and historical, shed light on treatment of the subject issues and provided an additional perspective on interview results.

C. Theory

Several fields of theory provided theoretical underpinnings for the design and implementation of the study. Theory framed the research questions, shaped study design, guided interview methods, and helped answer key decisions about study adaptation and modification when unexpected outcomes led to decision points. At heart, however, theory helped make sense of the mass of data accumulated during the course of the research. Different theories about organizations and security institutions helped put data points into a useful and comprehensible context, enabling the data to be mobilized into problem-oriented outcomes and new findings.

The study of organizations, in particular the fields of organizational culture and organizational learning, were key to understanding the data and placing it in useful context. Organization studies is a large and robust field, closely connected to psychology on one side and policy studies on another; these two related fields of theory also connect to this research. Organizational culture and learning theory are discussed at length in the theory review sections of this report.

In addition, strategic studies, in particular the field of strategic culture, also supported the study. Strategic studies, the theory and study of national and international security matters, ranges over topics including grand strategy, geostrategy, regional and area studies, military strategy, and specific functional issues like nuclear warfare. The “historical understanding of man’s efforts to achieve political ends through the application of military and diplomatic means”, including theoretical approaches to this understanding, is one explanation put forth by *The Journal of Strategic Studies*. Strategic culture theory helped shape the study from its earliest phases, and is discussed at greater length in the theory review sections of this report.

Concepts from environmental studies and environmental psychology also provided entry points into the data. A key element of the study focused on the influence of cultural factors in DoD and the military services on strategy and policy responses to climate change and energy dependence problems; one of the key cultural inquiries sought to characterize the orientation of DoD and the services towards the natural world. How do these organizations think about nature? In pursuit of this inquiry, theory from environmental studies and psychology provided helpful concepts and platforms for assessing the cultural position of nature in the military worldview. In particular, the concept of “superabundance”, which has been so influential in shaping American culture from colonial days, played a key role. Dryzek’s analysis of environmental discourses and politics was helpful to this element of the study³.

Military geography studies also provided helpful avenues for understanding and characterizing the orientation of the military services towards the natural world. In their textbook, *Modern Military Geography*, Galgano and Palka write:

Geographic information has been used to support military operations for as long as history has been recorded. This is because there is a clear and fundamental link between geography and military operations...By their very nature, military operations are geographic: they occur in places; and places contain unique physical environments...” (p. 1)

Military geography served as a bridge discipline linking environmental studies and psychology to military practice and strategy. By operationalizing and structuring military thought about the natural environment, military geography provides a clear window for understanding the practical, operational, and problem-oriented lens through which military organizations typically approach the environment. Understanding this perspective shed light on efforts to address environmental problems including climate change.

The References section (9) of this report provides a selection of sources that contributed theoretical perspectives to the study.

³ Dryzek, *The Politics of the Earth* (second ed. 2005)

1. Organizational culture

The following review of organizational culture studies draws heavily on the *Annual Review of Psychology* review, “Organizational Climate and Culture”, authored by Schneider, Ehrhart, and Macey (2013). In addition, it is drawn largely from a manuscript in draft that addresses the relevance of organizational culture theory to military organizations, which is still in progress but expected to be prepared for submission 2014-5.

Schneider et al define organizational culture as “the shared basic assumptions, values, and beliefs that characterize a setting and are taught to newcomers as the proper way to think and feel”; these assumptions, values, and beliefs are transmitted through “myths and stories people tell about how the organization came to be the way it is as it solved problems” (Schneider et al, 362). Schein (1992) identifies ten categories associated with the concept of culture: behavioral regularities (including language, custom, ritual, and tradition); group norms (implicit norms and standards); espoused values (publicly announced principles and values); formal philosophy; rules of the game (implicit rules, or “the ropes”); climate; embedded skills; habits of thinking (or mental models and linguistic paradigms); shared meanings; and root metaphors or integrating symbols (Schein, 8-10). When these building blocks are integrated into a meaningful, stable, and coherent pattern or paradigm, the concept of organizational culture becomes clear and powerful.

Schein embeds organizational climate within organizational culture; however later scholarship has broken climate out into a fully-fledged subfield of organizational studies. Climate is more closely tied to daily practice within an organization: the “perceptions of and meanings attached to the policies, practices, and procedures” of an organization, as well as what behaviors are rewarded, supported, and expected within an organization (Schneider et al, 362).

Major current themes in organizational culture research include leadership, national culture, organizational effectiveness, and culture as a moderating variable. Other research focuses on organizational commitment; some of this work has addressed commitment among members of the military (Gade, 2003). Research on the relationship between leadership and organization has also addressed the military (Halpin, 2011). Organizational culture research is diverse and varied.

In addition to the diversity present in the field, there are significant areas of disagreement. Martin identifies major rifts over whether culture is a “source of harmony” or a reflection of “inescapable ambiguities”; whether culture must be “internally consistent, integrative, and shared”; how boundaries might be set around culture; and how culture changes (Martin, 1992, 4). Smircich (1983) identified five major themes in organization research that reflect major differences in concepts of culture: (1) cross-cultural or comparative management; (2) corporate culture; (3) organizational cognition; (4) organizational symbolism; and (5) unconscious processes and organization (Smircich, 1983, Figure 1).

Morgan argues that all theories of organization “are based on implicit images or metaphors” that lead to only “partial” understanding of organizations.

Many different approaches to studying organizational culture have been proposed. Schein (1992) bases analysis of culture on three levels: (1) artifacts, which are visible organizational structures and processes; (2) espoused values, including strategies, goals, and philosophies; and (3) basic underlying assumptions, which are unconscious beliefs, perceptions, and feelings (Schein, Figure 2.1, 17). Martin (1992) offers three perspectives: (1) integration; (2) differentiation; and (3) fragmentation.

Clearly, the notion of organizational culture is highly relevant to military organizations, which are characterized by strong cultural identities. The ten categories of culture listed by Schein are all easily identifiable in military organizations, which emphasize shared markers of military identity as a way to bond warriors together, building the loyalty and group identity that are so key to successful warfighting.

Despite the clear manifestations of organizational culture in military organizations, and the interesting questions about effectiveness, learning, and change that can easily be raised by applying organizational culture theory to military organizations, surprisingly little research has been done in this area. The field of military psychology is well-developed, as the unique stressors of the military life pose important challenges to psychologists and researchers. However, the impact of military organizational culture on overall effectiveness has been mostly overlooked. Given the importance of effectively carrying out the national defense mission, the absence of research in this area is surprising.

In one of the few studies of military organizational culture, Ruvolo and Bullis (2003) studied a failed attempt at culture change and leadership at the U.S. Military Academy at West Point. The authors produced a careful analysis of a failed attempt to alter the organizational culture of an academic department at West Point, identifying key lessons for both consulting psychologists and organization leaders. Little attention was devoted, however, to probing the “warrior” culture that underlay the case study. Ruvolo (2007) also investigated the organizational culture of West Point specifically as it affected the culture of diversity that the organization sought to inculcate between civilian and military faculty. In a study of U.S. military culture aimed primarily at gender, Dunivin stated, “the combat masculine-warrior paradigm is the essence of military culture.” (Dunivin, 1994, 534). However, this analysis did not link concepts of organizational culture to effectiveness.

In the absence of psychology-based research in this area, much has been written on the subject without the benefit of organizational culture theory and frameworks. These books and articles frequently bleed into other theoretical disciplines, including strategic studies (strategic culture in particular, for obvious reasons), military history, and security studies⁴. The proliferation of writings on the subject of military culture, although absent

⁴ For example, see Johnston (1995), Kier (1995), Mahnken (2008). For a critical examination, see Desch (1998).

formal organizational theory, indicates widespread recognition of the significance of the concept.

Six key aspects of the U.S. military establishment argue strongly for analysis on organizational culture grounds: (1) the strong culture of the military, which places special emphasis on cultural manifestations including dress, behavior, jargon, ritual, and artifacts; (2) the collision of military culture with civilian leadership culture within DoD; (3) the unique cultures of each military branch; (4) the longstanding bureaucratic culture of the largest federal agency; (5) and the persistent challenge of reform that has plagued DoD.

To begin, the military as a whole places great emphasis on cultural markers. These include specialized dress, behavior, language and jargon, rituals, and artifacts. Many of these are strongly emphasized: these are not casual, toss-off elements of the organization but rather key elements of organizational identity that help its members understand their work and lives. Uniforms, rules of behavior, specialized language, and artifacts like medals and insignia, all separate warriors from the rest of civilian society. These cultural markers bond members of the military together into a unique community, reinforcing shared identity and forging unity. Given the stress and immense demands placed upon warfighters, the bonds of culture are functional: they serve to build the trust and unity necessary for successful military operations, and act as bulwarks against the sacrifice and loss experienced by military units and families.

The military is not isolated organizationally, however, but rather embedded into a bureaucratic framework headed by and populated with civilians at all levels, and tightly bound up with an industrial sector that is a shadow twin. The military services—Army, Navy (including the Marine Corps), and Air Force—are housed within the Department of Defense, America’s largest federal agency. The secretary of defense, along with the secretaries of each military service, are civilians. Operational military command is organized through the Unified Combatant Commands, nine geographical structures that distribute responsibility around the globe, under the authority of the Joint Chiefs of Staff. In addition, uniformed leadership advises the secretary of defense and president, as well as contributes to doctrine, from the Joint Chiefs of Staff and Joint Staff structure. Military personnel staff the Pentagon’s offices alongside civil service bureaucrats and, at the higher levels, political appointees. Military personnel cycle through on regular rotations (usually 2-3 years), and political appointees are usually expected to depart after a brief period as well. Civil servants, on the other hand, are durable members of the organization, often serving for decades.

In addition, each military service has its own unique culture, and the services have a long and widely recognized history of rivalry. The old “secure the building” joke is a classic example out of many jokes and aphorisms that illustrate the separate service identities⁵.

⁵ The joke asks how each service would respond to an order to “secure the building”. The Navy would lock the doors, unplug the coffee pots, and turn out the lights; the Army would secure all exits and surround the building with defensive fortifications and patrols; the Marine Corps would assault the building along three

There are, therefore, numerous intersecting and overlapping identities within DoD: civilian/military, military/bureaucratic/political; Army/Navy/Air Force/Marine Corps; intraservice distinctions linked to roles. These identifiable cultures and identities complicate a full understanding of how DoD and its subcomponents have engaged on climate and energy issues.

In a RAND Corporation study, Carl Builder addressed the distinct cultures of the military branches, while arguing: “The most powerful institutions in the America national security arena are the military services—the Army, Navy, and Air Force—not the Department of Defense or even their commander in chief, the president.”⁶ Builder’s study was a key supporting element of the research study, and his insights strongly shaped the research and contextualization of data.

Builder notes that “the military services have acquired personalities of their own that are shaped by their experiences and that, in turn, shape their behavior.”⁷ Although not formally an organizational culture analysis, Builder’s study provides a useful glimpse into the military services cultures. He addresses five “faces” of the services: (1) altars for worship (ideas or concepts that serve as inspirational and/or aspirational touchstones); (2) concerns with self-measurement; (3) preoccupation with toys versus the arts (i.e. what are sources of identity or pride, with what do people in each service identify themselves); (4) degree and extent of intraservice distinctions; and (5) insecurity about legitimacy and relevance⁸.

Builder’s analysis presents a powerful case for closely studying the organizational cultures of the military services in order to better understand the formulation and implementation of U.S. national security and defense objectives. In addition, service culture affects the implementation of strategy and policy. As one interview subject described it, in the Navy, when a decision is made, “that’s the point of departure” for “more discussion”. In the Marine Corps, in contrast, they may “fight internally” but “once the decision is made”, “everyone falls in line”.

In a study specifically of the U.S. Army—again, not based on organizational culture theory, but sharing some of the same impulses—Brian Linn described the Army “way of war”: “The army’s lack of empathy for the nation’s own citizens, its distrust of the political system, and its insistence that defense be the nation’s overriding priority” are defining characteristics of the organization. Further, these cultural characteristics have created “an institutional fable”: that the army’s battlefield success “has often been undermined by a lack of sufficient ‘will’ on the home front.”⁹ Linn therefore connects the culture of the Army to its organizational effectiveness on the battlefield.

axes, using overlapping fields of fire from all appropriate points on the perimeter; and the Air Force would take out a three year lease on the building with an option to buy. (Many variations on this joke abound.)

⁶ Builder, *The Masks of War*. 3.

⁷ *Ib.* at 7.

⁸ Builder, Chapter 2.

⁹ Linn, 236.

Each service has its own unique culture; these cultures interact with the culture of the DoD organization. Further exploration of the organizational culture of each military service is necessary for a full understanding of how the services are fitted into the Department of Defense.

An analysis by Thomas Mahnken, focuses on the role of technology in American military culture. Described as a “central pillar” of the “American way of war”, Mahnken identifies “technological optimism” as critical to a full understanding of U.S. military behavior (Mahnken, Chapter 1).

An organization as large, old, and important as the Department of Defense inevitably develops its own culture, which cuts across civilian-military/civil service-political appointment/service subcultures. The Pentagon itself serves as a touchpoint for this culture: people who work there refer to “the building”, or what is happening “in the building” much like legislative insiders refer to “the Hill”. The Pentagon, with its complex layout and impenetrable organization, is a powerful symbol of the insider culture of the Department of Defense. The layers of protection that surround both the Pentagon and its satellite location, the Mark Center, make clear that the functions housed within these buildings are very important and not easily accessible to outsiders. Once inside “the building”, newcomers quickly become lost in the maze of hallways. Offices, doors, and areas of the building are unmarked beyond small alphanumeric codes: one must know where one is going, since there is no directory or map provided. The inescapable military-heroic artwork provides additional clues to the culture of the Pentagon. Location, including proximity to the outer rings, is an indicator of status. Some hallways, which house important functions like the Joint Staff, are paneled in wood with brass plaques.

All of these accretions of culture and subculture may help to explain the challenge of reform at DoD. Change, in an organization as large and complex as DoD, could not be anything but challenging. Organizational and bureaucratic continuity and regularity are key components of effectiveness at DoD, but the need for predictable routine can often run counter to the need for change and adaptation to a changing organizational environment. Efforts at reform have come from several corners, notably including acquisition, social issues, and the environment. Over time, major efforts at reform include the Goldwater-Nunn report (1985), the Bottom-Up Review (1993).

Robert Durant’s seminal work on the “greening” of the U.S. military describes a multi-decade, multi-faceted effort to bring the U.S. military and DoD into compliance with environmental laws, often in the face of unbending resistance. Durant characterizes this process as “large-scale organizational change”, and builds a polity-focused framework for analysis that directs primary attention at interest groups, politicians, and political parties, as well as institutional structures, processes, and procedures. Durant describes a military attached to a Cold War-era “heroic myth of sovereignty, secrecy, and sinecure”, and fundamentally opposed to compliance with environmental regulations; in fact, taking advantage of every political window of opportunity to roll back compliance efforts. In

Durant's analysis, the military developed an "ethic" centered on "stability, predictability, and security of operations" in the uncertain post-Cold War security environment, which occasionally advanced "greening" efforts but failed to fully inculcate an ethic of environmentalism¹⁰. Durant's work provided major support to this research study.

2. Organizational learning and change

Other significant subfields related to organizational culture include organizational change and organizational learning. Huber described organizational learning as comprised of four constructs: knowledge acquisition, information distribution, information interpretation, and organizational memory.¹¹ Levitt and March view organizational learning as "routine-based, history-dependent, and target-oriented".¹²

Crossan et al developed the "4I" framework of organizational learning, based on four interrelated processes: intuiting, interpreting, integrating, and institutionalizing, that occur at the individual, group, and organization levels.¹³

Organizational learning theory has been applied to military organizations: Visser analyzed learning in the German Army 1939-1940, arguing that the "turbulent" environment of war, combined with the hierarchical and disciplined conditions of military organizations, make learning challenging but critical.¹⁴

3. Strategic culture

The concept of a national "strategic culture" that shapes how states perceive and address threats is relatively simple, yet this lens has rarely been turned on the United States, despite its origins during World War II, when cultural anthropologists¹⁵ were employed by the military to analyze the 'national character' of the Axis powers and describe the "nature of the enemy"¹⁶ Another wave of strategic culture studies emerged in the later

¹⁰ Durant, Chapter 11.

¹¹ Huber, George P. Organizational learning: The contributing processes and the literatures. *Organization Science*, 2(1): 88-115. (1991)

¹² Levitt, Barbara and March, James G. Organizational learning. *Annual Review of Sociology*, 14: 319-40. (1988)

¹³ Crossan, Mary M., Henry W. Lane, and Roderick E. White. An organizational learning framework: From intuition to institution. *The Academy of Management Review*, 24(3): 522-37. (1999)

¹⁴ Visser, Max. Learning under conditions of hierarchy and discipline: The case of the German Army, 1939-1940. *Learning Inquiry*, 2: 127-37. (2008)

¹⁵ Ruth Benedict's *The Chrysanthemum and the Sword*, on Japanese culture, is a classic example. (Boston: Houghton Mifflin, 1946). Much of this section is drawn from Rebecca Pincus's dissertation, "US DoD and the Challenge of Climate Change: An Inquiry into Organizational Adaptation and Resilience", completed under the aegis of the Minerva project

¹⁶ Desch, Michael C. Culture Clash: Assessing the Importance of Ideas in Security Studies. *International Security*, Vol. 23, No. 1 (1998)

Cold War period as some scholars pointed to cultural differences between the US and USSR to explain and predict different strategic “predispositions” and choices¹⁷.

As Johnston summarizes it, “Most of those who use the term ‘culture’ tend to argue, explicitly or implicitly, that different states have different predominant strategic preferences that are rooted in the early or formative experiences of the state, and are influenced to some degree by the philosophical, political, cultural, and cognitive characteristics of the state and its elites.”¹⁸ These strategic preferences, or norms, can arise from several different sources: “In the process of communication norms can emerge in a variety of ways: spontaneously evolving, as social practice; consciously promoted, as political strategies to further specific interests; deliberately negotiated, as a mechanism for conflict management; or as a combination, mixing these three types.”¹⁹

This approach stands in marked contrast to the realist approach to explaining and predicting state behavior, which presumes state rationality. Katzenstein provides this justification for looking beyond traditional rational models: “Perspectives that neglect social factors foreclose important avenues for empirical research and theoretical insight that are relevant for explaining specific aspects of national security.”²⁰

Although strategic culture does not change easily, the sudden trauma of 9/11 may have generated enough stress to alter the previously existing US strategic culture, according to Lantis’ discussion²¹. The change in focus from Cold War-era strategy to the new emphasis on global terrorism and other nonstate threats has generated broad change in US strategy. Changing attitudes towards the environment, encapsulated in theories of “environmental security”, may be one part of this realignment. In addition, global climate change, although without the kind of traumatic dilemma of 9/11, may also be forcing change in cultural assumptions about energy use.

Lantis writes, “Strategic cultural dilemmas define new directions for foreign policy and demand the reconstruction of embedded historical narratives...Democratic states are founded upon embedded national security values that can be tested in the face of strategic cultural dilemmas. Changes – including abrupt and fairly dramatic reorientations of security policy behavior – appear to be possible...”²². The co-occurrence of global climate change with increasing attention to notions of environmental security in the early 21st century generated pressure that has gradually led to the incorporation of climate change into current definitions of American national security.

4. Policy implementation

¹⁷ Johnston, 32.

¹⁸ Johnston, 34.

¹⁹ Katzenstein, Introduction, 21.

²⁰ Katzenstein, 7.

²¹ Lantis, 110-12.

²² Lantis, 112.

In studying the question of energy policy relating to the U.S. military, John Kingdon's model of policy windows proved very helpful. Kingdon's seminal work, *Agendas, Alternatives, and Public Policies*, attempts to answer the question, "What makes people in and around government attend, at any given time, to some subjects and not to others?" More specifically, he addresses the following: "why important people pay attention to one subject rather than another, how their agendas change from one time to another, and how they narrow their choices from a large set of alternatives to a very few."²³ Kingdon describes a model in which crises, or policy windows, create opportunities for policy problems to be solved through the convergence of political attention, a sense of urgency, and some plausible solutions.

Kingdon's book, its theoretical model, and the questions it identifies, bear strongly on this research study. We address those questions to the questions of POL consumption and climate change within DoD.

An important element of this generation of thought focused on the importance of individuals to policy outcomes, recognizing that organizations are comprised of many individuals acting in pursuit of their own goals, motivated by their own beliefs²⁴. As Mazmanian and Sabatier put it, "the energizing force of the implementation process is the rational pursuit by individuals of their desires for power, security, and well-being."²⁵ This emphasis on the individuals behind the organizations is useful at all stages of policy, from the initial writing of the statute by individual legislators with their own values and professional goals, to interpretation and execution of the statute by bureaucrats and agency staff members who have individual opinions about the policy as well as goals related to the agency structure and culture, all the way to the effects on those who are targeted by the policy²⁶.

The consequences of this focus on the individual are important, providing a helpful understanding about why policies succeed or fail. Mazmanian and Sabatier use the concept of "veto points" – points at which individuals can impede policy implementation – to highlight the importance of specific individuals to policy failure. They argue that the number of these veto points is crucial to a policy's achievement, and that minimizing the number of veto points through which a policy must pass is the best strategy to ensure success²⁷.

D. Multi-Theoretical Framework for Analysis

²³ Kingdon, 1-2.

²⁴ Milbrey Wallin McLaughlin. *Learning From Experience: Lessons From Policy Implementation. Educational Evaluation and Policy Analysis*, Vol. 9, No. 2 (1987) p. 174

²⁵ Daniel A. Mazmanian and Paul A. Sabatier. *Implementation and Public Policy*. Scott, Foresman and Co, Dallas (1983) p. 20

²⁶ Daniel A. Mazmanian and Paul A. Sabatier. *Implementation and Public Policy*. Scott, Foresman and Co, Dallas (1983) p. 20

²⁷ Daniel A. Mazmanian and Paul A. Sabatier. *Implementation and Public Policy*. Scott, Foresman and Co, Dallas (1983) p. 27

The research study was grounded in theory across several discrete disciplines, including security studies, psychology, and organization studies. In addition to investigating new questions about energy and climate security practices within DoD, the study therefore operated across disciplinary boundaries. In order to successfully integrate several bodies of theory, each of which individually promised rich insights, it was necessary to develop an interdisciplinary multitheoretical framework for analysis. The framework is pictured below:



Figure 1. Framework for analysis

This framework sets strategy at the peak of a pyramid, recognizing the primary function of strategy as high-level security practice, as well as the relatively smaller space occupied by strategic functions within the broader DoD organization. Culture, the middle layer, includes for our purposes both organizational culture theory and strategic culture theory. Culture is recognized here as embodying the medium through which security practices move, including the formation of strategy. Specific organizational characteristics are placed at the bottom, in recognition of their function as both outputs of culture and strategy, but also as guideposts for the transmission of culture and strategy. This three-layer framework enables the integration of multiple theoretical approaches, and a more refined understanding of the research problems. Rather than approaching each aspect of this pyramid independently, in a separate theoretical bubble, considering all three together permits a fuller understanding of the feedback between culture, organizational characteristics, and strategy. Huntington provides encouragement for linking strategy to organizational behavior and culture: “The strategic aspects of military policy, on the other hand, took considerably longer to change. Involved here were great bureaucratic organizations, ongoing military programs, and, of critical importance, established patterns of thought.”²⁸

Strategy is the most complex concept in the pyramid. Although strategy is usually defined along the following lines, “the application of military power to achieve political

²⁸ Huntington, *The Common Defense* (1961). 22.

objectives”²⁹, it is a large, complex, and mutable term. Builder discusses strategy as “a concept for relating means to ends”³⁰, which is a helpful conceptual description. For this research, the influence of culture on strategy is important. We argue, based on both on academic scholarship as well as the results of this study, that the ways in which DoD energy and climate strategy have emerged over time reflect DoD organizational characteristics and military culture.

Organizational characteristics also reflect culture. We use this term to mean aspects of the DoD organization that are pertinent to the research questions. For example, military personnel are rotated through short postings, and therefore when an officer lands in an energy or climate-focused office at the Pentagon, he or she likely has little to no training in the subject, and will not be spending more than two or three years there. Rotation is an organizational characteristic. For the purposes of addressing energy or climate issues, the frequency of rotation may be damaging, in that individuals do not have the time to develop and wield expertise in their subject area. However, rotation does offer benefits: individuals develop wide and varied experience, learn to “get up to speed” quickly, and do not become hidebound creatures of routine. As one interview respondent, who had struggled to advance energy-related programs, remarked, “if a base CO resists”, he or she “rotates out in two years”, and someone more amenable may rotate in. Rotation, although a characteristic feature of the U.S. military, is also bound up in military culture, as our model indicates, and cannot be fully understood in relation to policy development and implementation without reference to the culture it both grew from and sustains.

4. Research Activities

1. Interviews

Over the course of the research project, many interviews were conducted, almost entirely with individuals currently or formerly employed on relevant work for DoD. Some were active military; some former military; some were civil service bureaucrats; some were political appointees. Respondents were found through a “snowball” method, in which each interviewee was asked to put researchers in touch with additional subjects. This method led to some convergence, although given the large pool of potential respondents, this was limited. Additional information about interview methods is provided in section 3(B).

Interviews shed light, for the most part, on current and recent events. Individuals were asked about earlier periods of DoD history, in particular efforts in the 1970s to address energy issues. However, distance in time complicated the process of compiling interview data on events of that period. As a result, most interview data relates to policy developments of the 1990s and more recent years.

²⁹ Taken from *Strategy in the Contemporary World*, John Baylis, James J. Wirtz, and Colin S. Gary, eds. (p. 4, with a selection of different definitions of strategy on the following page.)

³⁰ Builder, *Masks of War*, Chapter 4.

2. Document/archival

Archival research was conducted at three locations: the Pentagon Library, the National Archives, and the Library of Congress.

The Pentagon Library provided access to annual reports by the Secretary of Defense to Congress. These reports, which provide a yearly indication of departmental actions and priorities, are no longer written. However, during the years in which they were issued, these reports offer useful records that permit issues like energy and environment to be tracked. Changes in departmental leadership and/or political leadership also can be tracked in these reports. All reports were analyzed; findings from these reports contributed particularly to the section on the second era of energy policy in the period 1973-80; further discussion of this period can be found in this report, 5(A)(1).

The resources at the Pentagon Library provided important access for research. While reading through every published DoD Annual Report, the usefulness of the Pentagon Library's repository was made clear. In addition, the knowledgeable and helpful staff provided guidance and assistance, and this report would be remiss without gratefully acknowledging their contributions.

The National Archives and Library of Congress provided access to important archival materials as well. In particular, the Library of Congress holds records relating to weather and climate modification and weaponization programs, which have been understudied. At the National Archives, many records of Congressional work on energy and climate were accessed.

The colocation of the Library of Congress, National Archives, and Pentagon improved the efficiency of the research study: interviews and archival research could be conducted on the same research visit to Washington, maximizing use of time and travel budget resources.

4. Evolution of research study

As research progressed, it became clear that some modifications in the initial study plan were required. Interviews, which were initially planned to be recorded, transcribed, and analyzed with language-analysis software, were instead conducted off-record. This modification made several improvements on the research plan: interview subjects were more willing to be interviewed and to speak freely; limited researcher time was not spent on transcription; and the language-analysis software (NVivo suite) proved to be less useful than originally anticipated. Transitioning away from the analysis software enabled greater focus on archival research and interviews, broadening the scope of materials and individuals accessed during the study.

In addition, it became clear that gathering tight data on DoD spending on energy and climate issues could comprise an entire study itself. Budget data is large and dispersed in

many programs. A research assistant tasked with gathering budget data worked heroically to provide a path into the mass of data, but was rapidly overwhelmed by the scope of the project. This particularly became insurmountable as research focused on earlier periods of activity around energy programs and climate work in DoD: the time periods under scrutiny expanded the scope of potential budget data.

For a comprehensive analysis of DoD spending on energy and climate programs over the period covered by this study (1945-present), additional research is recommended. The variety of programs, dispersed across the services and components of DoD, make gathering and analyzing budget data quite time-consuming. Although the decision was made in this study to modify our approach in order to better answer the research questions at hand, thereby expanding the historical scope at the expense of budget specifics, further research in that area may be useful.

5. Research Findings

A. Energy: POL dependence and consumption

1. Identification of problem and history

Initial research focused on learning more about the identified issue of petroleum/POL dependence and consumption. Historical research, including primary archival materials and secondary sources, produced a more refined research problem: it became clear that earlier generations had struggled to tame the problem of petroleum dependence and consumption. Other scholars have noted the long history of the energy challenge: “for over thirty years”, “The United States has yet to take any meaningful action to reduce its energy dependence.”³¹

In the course of the research study, two significant policy eras were identified: (1) the immediate post-World War II period, and (2) 1973-1980, during which efforts were made to address the vulnerabilities associated with petroleum consumption and dependence.

In light of these earlier generations of policy efforts to address POL consumption and dependence, the question naturally arises, why did they sputter out? Can lessons be drawn from earlier policy attempts that may inform current efforts to reduce consumption?

(a) Post-war policy window

In the wake of World War II, a war in which the ability of the United States to supply large quantities of both war machinery and the POL on which it ran played a decisive

³¹ Bacevich, 212.

role, the U.S. faced a major change: moving from being a net oil exporter to a net oil importer. The prospect of becoming dependent on foreign sources of oil, at the very moment when the overwhelming military importance of oil had just been forcefully demonstrated, caused alarm in policy circles, both military and civilian.

A “serious” oil shortage hit the U.S. in the immediate post war period, 1945-47, followed by a crippling “fuel crisis” in the Northeast during the winter of 1948³². This series of crises, at the exact time that the United States was transitioning from a net oil exporter to net importer (1947), drew policy attention to the problems associated with petroleum dependence and consumption.

(b) 1970s policy window

In the 1970s, the emergence of OPEC and other significant developments caused several energy crises, including curtailed supply and price shocks. These crises provoked concern within DoD about security of POL supply and disruptions to budgeting, in a broader context of policy concern about petroleum dependence and energy security that engaged Congress and the administrations of Nixon, Ford and Carter.

Without going into great detail, Nixon imposed price controls in 1971, keeping oil prices low and simultaneously discouraging domestic production and encouraging consumption³³. Refinery capacity shrank, setting up a larger problem. The price controls distorted the petroleum market, and additional allocation programs compounded the problem. American oil consumers were increasingly dependent on imported oil; in October 1973, following American support to Israel in the Yom Kippur War, OPEC retaliated by imposing an embargo on the U.S. Although shortages had begun to emerge in 1972, the 1973 embargo provoked “extremely chaotic conditions”³⁴. Although the embargo was officially lifted 18 March 1974, the effects of the embargo were widespread. “The American reaction...was a babble of conflicting voices...Diagnoses of the problem ranged from near-fatal disease to mild indisposition to rampant hypochondria...”³⁵

DoD was affected by the fuel crisis. The Defense Fuel Supply Center (DFSC), which at the time was responsible for procurement of all fuels for DoD, began having “critical” difficulty filling orders in March 1973, as a result of fixed military contracts at prices lower than the governmentally-frozen prices³⁶. As shortages grew, “what had been a

³² Melosi, *Coping with Abundance*, 1985. 254.

³³ Many books provide comprehensive analyses of the 1970s energy crises: Yanek Mieczkowski, *Gerald Ford and the Challenge of the 1970s*, (2005) Chapter 12; Dankwart A. Rustow, *Oil and Turmoil* (1982) were useful here.

³⁴ Mieczkowski, quoting Florida governor Reuben Askew. 206.

³⁵ Rustow, 174.

³⁶ Report by the Special Subcomm. Of Dept. of Def. Energy Resources and Req. of the Comm. On Armed Services, House of Rep. with Special Concurring Views. 93rd Congress. 1 June 1974. HASC 93-48. 19-20.

serious problem for [DFSC] was suddenly converted in mid-October into a crisis” by OPEC’s actions.

Congressional action included a special House subcommittee on Department of Defense Energy Resources and Requirement, of the Committee on Armed Services. This subcommittee’s report, 1 June 1974, made clear that the first policy priority was ensuring adequate supplies of POL for DoD. Its first recommendation made this clear: “The Congress, in conjunction with the Executive Branch, should ensure reliable sources for the petroleum products required by the Armed Forces of the United States. Sources should not be subject to disruption by either the foreign policies of other nations or by the sales practices of domestic refiners.” The final, ninth recommendation, addressed alternatives: “The Department of Defense should accelerate research and development for alternate sources of fuel.”³⁷

The FY1975 report discusses the impact of the fuel crisis in 1973. Noting that DoD energy consumption in FY1974 was \$2.5 billion, the report stated that “this area represented a prime opportunity for economy”, and described the consolidation of bulk fuels under the responsibility of the Defense Fuel Supply Center (DFSC) of the Defense Supply Agency on July 1, 1973. The timing of this move was fortuitous: the embargo tested the new system. The new centralized system performed well: “As significant shortages of bulk fuels began to occur, we were able to distribute the diminishing resources more effectively.” However, the severity of the supply crisis was overwhelming. The military services were forced to take “strict actions to conserve fuel”, while trying to avoid “unacceptable” impacts on military readiness. Some actions included in the Secretary’s report were: “a major reduction in aircraft flying hours”; “a reduction in the speed of Navy ships during transits and operations and a major overall reduction in Navy ship operations”; an increased emphasis on reducing energy requirements through R&D programs”; and “an aggressive energy savings program throughout DoD to decrease heating, lighting, and vehicle fuel use”. The Secretary wrote, “I am proud of the conservation performance of the armed forces which has resulted in Defense leadership of all federal agencies in energy conservation.” While calling for the activation of the Elk Hills Naval Petroleum Reserve, the report stands out for devoting over two pages to the topic of energy, and emphasizing efficiency and management of energy along with the development of alternative and high-efficiency technologies.

Annual reports through the rest of the decade reflect interest in petroleum consumption levels, spending on POL, management of energy resources, and technological development. The petroleum reserves are regularly discussed.

A shift in tone is evident between the Ford and Carter administrations. Carter was notable for championing energy-related policies, and language from reports during his administration reflect a connection to broader administration goals.

³⁷ Report by the Special Subcomm. Of Dept. of Def. Energy Resources and Req. of the Comm. On Armed Services, House of Rep. with Special Concurring Views. 93rd Congress. 1 June 1974. HASC 93-48. 4-5.

For example, Secretary Schlesinger's FY 1976 report noted that consumption targets were held to crisis-level caps—"because of price and budgetary constraints". Spending to reduce energy consumption was linked to business sense: "Defense R&D programs will be concentrated in those areas promising the most direct payoff in improved specific fuel consumption"; in addition, requested funding "would initiate viable energy savings programs in most of our military bases in CONUS and, through reduced operating costs, would be amortized in one to five years."

In contrast, Secretary Brown's report of FY 1979 spent less time on specifics and more on big policy: "Only by means of expansion, diversification, and conservation can we surmount the energy crisis. Only by surmounting the energy crisis can we retain the strength necessary to uphold U.S. security." The following year, four avenues of effort were identified, but still little detail was provided: "supply assurance"; R&D for "mobility fuels"; "energy technology demonstration projects with the Department of Energy"; and "facilities energy conservation".

Secretary Schlesinger wrote, "DoD does not intend to undertake R&D projects in areas where civilian agencies or industry have the lead and required expertise", but would cooperate in limited ways: "DoD is prepared to provide family housing units as test platforms for solar heating and cooling demonstration projects". Secretary Brown, in contrast, demonstrated greater enthusiasm: "[DoD] and [DoE] have completed preliminary planning on major energy demonstration initiatives, including projects using solar energy, photovoltaics, geothermal electricity, geothermal space heating, wood-fueled central power plants, and three 'showcase' installations of energy technology." In addition, Brown explicitly links DoD efforts to "the President's conservation goals".

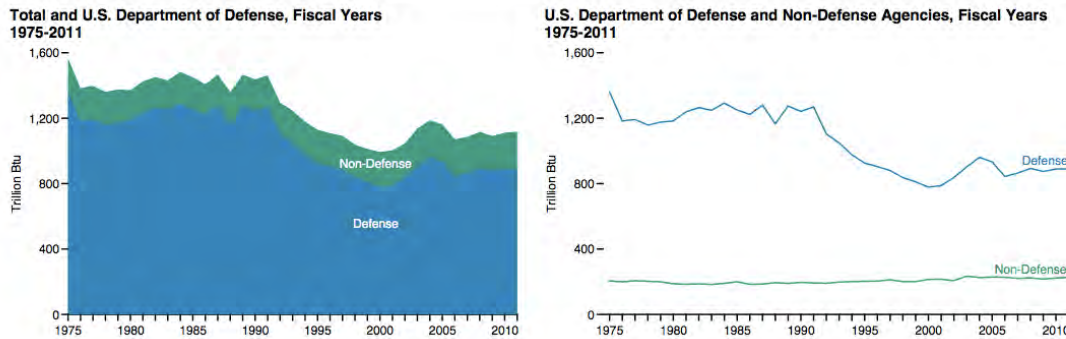
It should be mentioned that energy issues, although appearing to draw meaningful attention, were on the far back burner of DoD policy, tucked into the very end pages of the annual reports after the discussions of larger and more conventional military issues. In addition, these annual reports ballooned over the years, to over two or three hundred pages. Dropping petroleum prices in the 1980s were reflected in decreasing emphasis on energy in annual reports. As the energy crises faded from public attention, a new administration entered office, and a new Secretary of Defense. The policy cycle moved away from energy, and towards new priorities. Secretary Weinberger's first Annual Report made no mention of energy, setting a trend that was to persist.

(c) Current era: Iraq, Afghanistan, and renewed interest in energy 2003-4

The evidence for earlier policy eras characterized by efforts to rein in POL consumption and dependence can be placed beside clear evidence of sustained energy demand by DoD, as well as increasing costs for POL over time. Since 1975, as the following chart from the Energy Information Agency (EIA) demonstrates, DoD energy consumption has dropped. DoD petroleum consumption in 1975 was 1,174.2 trillion Btu; in 2011 it was

759 trillion Btu³⁸. The lowest consumption occurred in 1999, at 622.9 trillion Btu; the highest was 1975.

Figure 1.11 U.S. Government Energy Consumption by Agency



Source: U.S. Energy Information Agency, Annual Energy Review 2011, September 2012. (p. 24)

DoD spending on petroleum is linked to the global oil market, and so price increases drive increased spending. Rapid changes in oil prices challenge DoD budgets. The following table provides a recent example of spending trends. In FY2000, fuel costs were 1.2% of total DoD outlays, but had doubled to 3% in FY2008³⁹. The uncertain costs associated with POL challenge budgeters and policymakers, introducing uncomfortable unknowns into the enormously complex DoD budget process.

Table 3. DESC Fuel Costs vs. DOD Budget Authority & Outlay
(\$ billion)

	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
BA	290.5	309.9	332.1	437.8	471.0	483.9	593.7	602.2	673.5
Outlay	294.5	308.5	332.1	387.3	436.5	474.2	499.3	529.1	594.6
O&M	105.9	112.0	114.7	151.4	174.0	188.1	203.8	216.6	244.8
Fuel Cost	3.6	4.2	4.1	5.6	6.8	8.8	11.5	11.5	17.9
% Outlay	1.2	1.4	1.2	1.4	1.5	1.9	2.3	2.2	3.0
% O&M	3.4	3.6	3.6	3.7	4.5	4.7	5.6	5.3	7.3

Source: National Defense Budget Estimates (Green Book) 2001-2010, <http://www.defenselink.mil/comptroller>, and Defense Energy Support Service, Fact Book (2000-2007).

Notes: BA—Budget Authority in Current Dollars. O&M—O&M Outlay.

³⁸ Consumption figures from EIA. Annual Energy Review 2011, September 2012. (Table 1.12, p. 27).

³⁹ Congressional Research Service report, "Department of Defense Fuel Spending, Supply, Acquisition, and Policy." Anthony Andrews. 22 September 2009 (p. 5).

Source: taken from Congressional Research Service, “Department of Defense Fuel Spending, Supply, Acquisition, and Policy”. Anthony Andrews. 22 September 2009. (p. 5)

We are currently experiencing a third wave of policy efforts directed at addressing the problems of petroleum consumption and dependence. This period started 2003-2004, as insurgent attacks on fuel supply convoys in Iraq, along with the high cost of delivering fuel to the front, drew renewed attention from both inside and outside DoD. As one interview respondent described it, the “phone lines started ringing” in 2004.

In 2001, during the last period of sustained effort on energy before the terrorist attacks of September 11th completely altered defense priorities, a Defense Science Board paper was published that addressed energy questions head-on. Dryly titled “More Capable Warfighting through Reduced Fuel Burden”, the report argued for increased attention to fuel efficiency in DoD and identified institutional barriers that prevented energy issues from being clearly identified.

The 2001 DSB report presented five findings: “(1) Although significant warfighting, logistics and cost benefits occur when weapons systems are made more fuel-efficient, these benefits are not valued or emphasized in the DoD requirements and acquisition processes; (2) DoD currently prices fuel based on the wholesale refinery price and does not include the cost of delivery to its customers...; (3) DoD resource allocation and accounting processes do not reward fuel efficiency or penalize inefficiency; (4) Operational and logistics wargaming of fuel requirements is not cross-linked to the Service requirements development or acquisition program processes; (5) High payoff, fuel-efficient technologies are available now to improve warfighting effectiveness in current weapon systems...”⁴⁰

Unfortunately, the events of 9/11 sidelined the 2001 DSB report. It was not until approximately 2006 (according to interviewees directly involved), that the earlier report was discovered “sitting on the shelf”. A new DSB task force was launched to update and broaden the earlier findings. The new version, released in 2008, featured a more attention-getting title: “More Fight—Less Fuel”.

The 2008 DSB report struck a chord. On Capitol Hill, legislators found an issue with legs: in particular, Democratic lawmakers, who saw in the report a way to both strengthen pro-military credentials as well as to advance core issues of alternative energy and energy efficiency. The uniqueness of the opportunity, as well as the policy window opened by the convoy crisis, and the shifting ground of the 2008 elections, brought swift change. The Duncan Hunter National Defense Authorization Act for FY 2009 established an Assistant Secretary of Defense for Operational Energy Plans and Programs, to “conduct oversight” and “establish the operational energy strategy” for DoD and the Army, Navy, Air Force, and Marine Corps (10 U.S.C. §138c(a),(b)). Operational energy was defined as “the energy required for training, moving, and sustaining military forces and weapons

⁴⁰ DSB, More Capable Warfighting through Reduced Fuel Burden. (2001) ES-2-ES-5.

platforms for military operations. The term includes energy used by tactical power systems and generators and weapons platforms.” (10 U.S.C. §138c(h)).

The cost of delivering fuel to the front lines of operations is significantly higher than the purchase cost. More important, however, are the vulnerabilities associated with fuel consumption and dependence in theater. Supply lines and convoys bringing fuel forward are frequent targets of attack. Troops may have to be pulled from operations to protect supply convoys.

In summary, the “problem” of POL consumption and dependence is multipart: its financial cost; the uncertainty associated with its price volatility and some key suppliers; the liabilities associated with its delivery to front line troops. Although petroleum is a remarkable energy source, delivering highly concentrated energy in a stable and easily transported format, the problems associated with it are unmistakable and have been visible for many decades. The question arises: why did earlier efforts to rein in consumption and dependence run aground?

2. Organizational characteristics

Beginning at the base of the analytic pyramid, are there organizational characteristics in DoD that affect its response to POL consumption and dependence problems?

1. Reliance on performance metrics as benchmarks of success
2. The importance of leadership to the nature, direction, and outcome of change
3. The significance of the acquisition process; closely related is the importance of the requirements process that shapes acquisitions
4. The existence of large suborganizations within DoD whose mission is to supply fuel

(a) Metrics

Organization scholars have long known that performance measurement, and reward systems designed to improve performance, may not lead to improved performance or accurate information about performance. If the metrics that are used to measure performance do not actually provide information about how close the organization is to realizing its goal, those metrics in reality impede full knowledge about performance. Similarly, if reward systems are not aligned with performance goals, they may discourage or distract from what is really desired. Kerr notes that organizations “where rewards are dispensed for unit performance or for individual goals achieved, without regard for overall effectiveness”, self-interest is rewarded over the interest of the whole organization. Furthermore, it is difficult to measure and therefore reward intangibles like “team building, interpersonal relations, creativity, etc.”, so the organization “*hopes* for employee effort” in those areas, “but it formally *rewards* none of these”⁴¹.

⁴¹ Kerr, Steven. On the Folly of Rewarding A, While Hoping for B. *AMJ*, 18(4) 1975.

Kerr points to budget processes as a powerful example: “As a final, clear-cut example of a fouled-up reward system, consider...the allocation of next year’s budget as a direct function of this year’s expenditures. It probably is conceivable that those who award such budgets and contracts really hope for economy and prudence in spending. It is obvious, however, that adopting the proverb ‘to him who spends shall more be given,’ rewards not economy, but spending itself.”

Public organizations are confronted with a difficult problem of correctly measuring performance towards achieving goals, and structuring incentives and processes towards achieving those goals. In addition, the rapid turnover in personnel, along with the politicized budget process, makes long-term change difficult.

“Public administrators are tackling twenty-year problems with five-year plans staffed with two-year personnel funded by one-year appropriations.”⁴² In DoD, this razor-sharp assessment holds true. Interview data frequently pointed in the same direction: “short time frames” for individuals place emphasis on “quick results and successes” rather than the “long term”.

“Though conceptually simple, the task of aligning performance measurement criteria with reward criteria is a challenging one”, note Stone and George (1997); further, “reward systems beget firm behavior...Incongruent agency mission and reward systems can lead to agency performance that satisfies reward criteria but not agency objectives.”⁴³

Interview data support the academic consensus: “you need to have the right metrics or you end up with perverse incentives”; “numbers are blunt instruments”, that may give you “wrong information”. Respondents described being pressured to give numbers, noting, “you get what you measure”: metrics are used to assess performance and reward. Metrics are particularly important “at the beginning” of the process, when new programs are getting underway.

When approaching a complex problem like energy consumption, constructing the right metrics for measuring performance, building the appropriate incentive systems, and following these projects through time becomes quite difficult. For example, it might seem that simply measuring fuel consumption by service branch, and pushing for reductions in fuel used, could be an easy metric. However, fuel reductions may reduce operational readiness.

Interview data indicated that efforts to reduce petroleum consumption in the 1970s failed due to the problem of metrics. Setting targets for reductions in fuel use “induces wrong behaviors”. The policies set up to reduce POL use created targets that were “antithetical to military missions”. They “never figured out” how to create change through metrics that

⁴² Harland Cleveland, former ambassador to NATO, quoted in Bushnell and Halus (1992)

⁴³ Stone, Warren S. and George, Gerard. On the Folly of Rewarding A, While Hoping for B: Measuring and Rewarding Agency Performance in Public-Sector Strategy. *Public Prod. & Man. Rev.* 20(3):308-322 1997. 308.

were “compatible” with military missions before the price of oil dropped and the Reagan administration took office, with its own clear defense spending priorities.

The Operational Energy Office has learned from this: not to focus on “what you are going to give up” to get fuel reductions.

(b) Leadership

Organization scholars have long recognized the significance of charismatic leadership to any organization. Within DoD, and the military services, charismatic leadership is especially important, given the vertical nature of the organization. When it comes to introducing new programs, in particular addressing unconventional issues like climate change or issues of longstanding importance from unconventional angles, like energy consumption, the importance of leadership is even more strongly influential.

Interview data back up the importance of leadership. Leaders have “tremendous power” to “drive discussion” and set the tone, content, and priorities; although not actually driving action, leaders can shape the conversation. “Leaders at the top can make a difference”, noted one respondent.

An example repeatedly cited is Secretary of the Navy Ray Mabus, who has made better use of energy a key element of his leadership program⁴⁴. In particular, Mabus has championed the Navy biofuels program, headlined by the Great Green Fleet. Interview data indicates that Mabus’ leadership has served as a high-visibility, powerful motivating force and guiding direction for individuals involved with the Navy energy programs, but also that his unique emphasis on the biofuels program has stamped it with his imprint, raising questions about the durability of the program after his eventual departure.

(c) Acquisition process

Within DoD the acquisition process is spoken of in ways that make clear: this is a special process. It is of overwhelming importance. It has become part of the culture. However, given the organizational functions of the acquisition process, we discuss it here.

Interview data strongly identifies the acquisition and requirements process as a key area that must be touched by efforts to address energy consumption. The acquisition process is “entirely fear-driven”. It is “not always driven by reason or law”.

These are strong words.

The incentives of the individuals working in acquisition are, according to interview data, pointed away from innovation or challenging standard operating procedures. These personnel, who have the power of signing contracts on behalf of the Department of

⁴⁴ For example, visit Secretary Mabus’ 4 Priorities website: www.navy.mil/secnav/index.asp

Defense, and, by extension, the United States of America, feel the burden of this power and wield it carefully.

Acquisition reform has been a perennial topic of interest. In 1993, calls were made for reform: “Our acquisition organization is segmented, overly specialized, and hierarchical. There are so many hand-offs of responsibility for any one acquisition program that accountability is difficult, and the ability of any one person or organization to change the process is small.”⁴⁵

In 1985, the Goldwater-Nunn task force also identified the “predominance of programming and budgeting” as a problem for DoD: “The overly extensive focus on resource decisions leads to insufficient attention to other important responsibilities.”⁴⁶

This topic has been identified by scholars as well: “The pervasive materialist bias...distorts our entire approach to defense policy and military matters in general. With few exceptions...Pentagon officials, military chiefs, Congress, and the media all focus their attention on the measurable, material “inputs” that go into the upkeep and growth of the armed forces.”⁴⁷

(d) Opaqueness of energy bills

One interview respondent pointed out that, “because of human nature”, it can be hard to get people to think about energy consumption, because energy consumers are not paying the energy bills. In addition, base COs do not regularly keep any energy savings they may realize from implementing energy-savings programs; therefore, incentives towards conservation may be significant. This insight reinforces the critical role of metrics and measurement discussed earlier.

3. Cultural

(a) Crisis

The very notion of a fuel “crisis”, as the price and supply fluctuations of the 1970s were characterized, is problematic. A crisis, by definition, leads people to seek resolution and a way out of crisis: it is a temporary situation that should be fixed. Crisis language is oriented towards a state in which the conditions of crisis are resolved. Deudney, no fan of environmental security, explains this: “Crises call for resolution, and the patience of a mobilized populace is rarely long. For most people, exertion in a crisis is motivated by a desire to return to normalcy, for the problem to be resolved once and for all. Such a cycle

⁴⁵ DoD, Report on the Bottom-Up Review, October 1993. 101.

⁴⁶ Defense Organization: The Need for Change. Staff Report to the Committee on Armed Services, U.S. Senate. Goldwater-Nunn Task Force on Defense Organization. 16 October 1985. 620.

⁴⁷ Luttwak, Edward. *The Pentagon and the Art of War*. (1984) 139. Quoted in Goldwater-Nunn.

of arousal and somnolence is not likely to make much of a contribution to establishing sustainable patterns of environmentally sound behavior.”⁴⁸

(b) Superabundance

One of the keys to understanding how DoD and American military culture treats petroleum—indeed, any energy source—is the concept of superabundance. Udall described this myth:

It was the intoxicating profusion of the American continent which induced a state of mind that made waste and plunder inevitable. A temperate continent, rich in soils and minerals and forests and wildlife, enticed men to think in terms of infinity rather than facts, and produced an overriding fallacy that was nearly our undoing—the Myth of Superabundance. According to the myth, our resources were inexhaustible. It was an assumption that made wise management of the land and provident husbandry superfluous.⁴⁹

The myth of superabundance, leading to the assumption that limitless resources obviated any need for efficient use or conservation, strongly shaped American culture. “What seemed most remarkable to colonists about North America was its abundance of resources”, and this abundance led to a “commodification of nature”: both abundance and commodification profoundly shaped the American “relationship with nature”: “Together, then, abundance and the production of raw materials distanced people from nature. They took nature’s wealth for granted; then they forgot it existed.”⁵⁰

“Not the constitution, but free land and an abundance of natural resources open to a fit people, made the democratic type of society in America”, wrote Frederick Jackson Turner, arguing that Americans’ “most fundamental traits, their institutions, even their ideals” grew out of the seeming inexhaustibility of natural resources, and “were shaped by this interaction between the wilderness and themselves.”⁵¹ Udall wrote, “The ideas of independence and free land were always inseparable.”⁵² Further, “After we won our independence, the making of land-myths became a national pastime. The myth-makers infected our politics and produced the Go West and Manifest Destiny movements.”⁵³

Cultural attitudes towards the natural world, shaped by assumptions of superabundance, necessarily include energy sources.

⁴⁸ Deudney, 466.

⁴⁹ Udall, *The Quiet Crisis*. 1963, 54.

⁵⁰ Mark W. T. Harvey, Humans and the environment in America’s past. *OAH Mag. Of Hist.* 10(3): 5-11. 1996. 5-6.

⁵¹ Frederick Jackson Turner. The West and American Ideals. *The Wash. Hist. Quarterly*, 5(4): 243-57. 1914. 245.

⁵² Udall, *The Quiet Crisis*. 1963, 17.

⁵³ *Ib.* at 28.

The United States was blessed with abundant energy sources throughout its history. Whether immediately exploitable or only potentially so, these sources were vital to the developing nation in the nineteenth century and the developed nation in the twentieth. Abundance affected the way Americans used energy, how businesses developed and marketed it, and how government established policies about it...The energy history of the United States, therefore, has been an ongoing effort to cope with abundance.⁵⁴

Furthermore, “Endowed with an abundance of domestic sources of energy and having access to foreign sources, Americans expected supplies to be never-ending and cheap. Energy was often a counterweight to traditional scarcities...”⁵⁵ Abundance shapes American culture, and “all aspects of American life in a fundamental way”⁵⁶. Abundance, and the assumption of indefinite abundance, leads to squandering and inefficient extraction of energy resources⁵⁷. Furthermore, assumptions about abundance by the American people guide public energy policy. “In large measure, national energy policy failed to move beyond a policy of abundance at a cheap price.”⁵⁸ Udall remarked, “When it came to petroleum, the Myth of Superabundance reached an absurd climax.”⁵⁹

The extended discussion of superabundance, and the influence it has had on American culture and energy policy hopefully makes clear the significance of this cultural characteristic. It is fundamental enough, dating back to the earliest days and founding myths of the nation, to have penetrated throughout the culture. The American military, and DoD, are not immune to culture; in fact, certain aspects of American culture are concentrated in the military institutions. Abundance, as a cultural value, was reinforced in the military during the formative experience of World War II. During that war, the abundance of Allied oil, along with men and machinery, further cemented ideas about abundance: “Energy abundance, indeed material abundance in general, is a key to understanding the successful prosecution of the war *and the society that emerged in the wake of that war.*”⁶⁰

It can be argued that American abundance, notably of petroleum, shaped strategy and led to victory in World War II. As the defining moment of glory for the modern American military, the WWII experience shaped military culture, values, strategy, and organizational characteristics. Interview data support this conclusion. As one respondent put it, the U.S. military has a “culture of more mass”, in which reaching for a solution of applying greater mass is natural.

The concept of abundance also penetrates the DoD budget process. DoD budgets are large, and the importance of the mission justifies high spending. As one interview subject remarked, “We have no problem” paying “ridiculous” amounts of money “for certain

⁵⁴ Melosi, *Coping with Abundance*, 1985. 3.

⁵⁵ Melosi, 8.

⁵⁶ David M. Potter, *People of Plenty*, 1954, quoted in Melosi, 8.

⁵⁷ Melosi, 12.

⁵⁸ Melosi, 12.

⁵⁹ Udall, *The Quiet Crisis*. 1963,60.

⁶⁰ Melosi, 194. Emphasis added.

capabilities”. Other respondents reinforced this conclusion. You “can’t put a dollar value on some capabilities”. Military effectiveness is the bottom line for DoD.

Conversely, “efficiency” is a problematic concept for the operationally focused parts of DoD. The divide between installation/facilities energy and operational energy is reflected in different approaches to addressing energy use. For installations, the advance of building technology and the regular pressure to find efficiencies and cut costs means that reducing energy consumption is accepted as part of doing the job. “Efficiency” is a key part of running a base well. When it comes to operational energy use, however, “efficiency” has a very different set of connotations. To some interview respondents, efficiency means doing the same dangerous job with fewer resources, taking on greater risks, and having fewer means available for the mission. Despite widespread acknowledgement of wastefulness in operations, respondents touched on the need to put the mission ahead of cost-savings and efficiency. This objection is deep-rooted, entirely plausible, and must be addressed directly in the pursuit of any energy-reduction program. One interview subject wished for another word to replace “efficiency”, bemoaning the negative connotations of the term in DoD.

(c) Identification with war machinery

In understanding the elements of American military culture, Builder’s analysis is invaluable. He argues that the tools, or “toys” of the military, chiefly ships, planes, and tanks, are critical to a full understanding of military organizations and organizational behavior: “The things that attract and hold the attention of service professionals at the individual level provide an insight into the preoccupations of the service that go deeper than the assertions of the institution itself.”⁶¹ As individuals, the users of these machines become closely identified with them. Using the example of the ICBM, Builder makes this point clear:

The ardent advocates of the new ICBM were committed to that cause because they could not be otherwise. They had devoted their professional lives to those machines. Their own personal worth and the worth of ICBMs had become intertwined in a way that could not be easily separated. To consider that development of new ICBMs might no longer be necessary or worthwhile was equivalent to considering whether they, themselves, were any longer necessary or worthwhile.⁶²

Interest in the tangible tools of war is understandable, and is reinforced by the budget process. As one respondent noted, the “essence” of what the services do is “build combat systems and operate them”. Interview data support this: a respondent noted that the services each have “preconceived” notions about the way they go about fighting—the Air Force, with fighter jets, the Army with tanks and the next ground combat system, the Navy with warships and carrier-based fighters, and the Marines with amphibious assault vehicles. If it doesn’t fit neatly into what services already know, how does it fit? The

⁶¹ Builder, 22-23.

⁶² Builder, 41.

question points to the importance of military platforms to the services and DoD more broadly.

Furthermore, the cultural identification with war machinery in the services shapes budget priorities. As one interviewee remarked, “If they only have a dollar to spend, they are going to spend it on a gun, not on making the gun better or easier to sustain.” In this quote, guns stand in for ships, planes, tanks, and the other countable tools of war. The respondent went further: “like glaciers moving downhill”, people get committed to defense programs and are “hard to move”.

(d) Logistics isn't sexy

Culture is the middle layer of our analytical pyramid, because it functions as a medium through which organizational characteristics and strategy emerge. The culture of the American military, like many militaries, places emphasis on warfighting. The dull business of supporting troops, of logistics, and of supply lines, is simply less interesting. Logistics are critical to the effectiveness and success of any military operation: this is widely recognized and reflected in the military aphorism, “amateurs talk strategy, professionals talk logistics”. However, actual emphasis on the strategic components of logistics had been very rare: “logistical factors have been ignored by ninety-nine military historians out of a hundred—an omission which has warped their judgments and made their conclusions in many cases wildly misleading”⁶³. Howard describes the preference for operational questions over logistics in the practice of strategy as “a prejudice common to all fighting soldiers in all eras” (Howard, 976).

Logistics, and supply lines, are not high-status within DoD culture; this position is reflected in underemphasis in military strategy⁶⁴.

4. Strategy

Kanter argues that the strategies and policies advocated by the services “were conditioned by threats and opportunities they perceived in their organizational environment.” In particular, the services sought to align their strategy and policy with the interests of politicians in order to maximize allocation of budgetary resources⁶⁵. Builder makes the controversial point that military strategies are developed and championed less as “logical responses to threats”, but more to advance “organizational and institutional interests”. In this view, strategy serves to justify desired organizational goals, including defending and advancing service priorities.

⁶³ Michael Howard, The forgotten dimensions of strategy. *Foreign Affairs*, 57(5): 975-86. (1979). 976.

⁶⁴ For the most authoritative discussion of logistics and military strategy, see Van Creveld, *Supplying War*. (second ed. 2004)

⁶⁵ Kanter, *Defense Politics*, 101. (1979). Quoted in Builder, *Masks of War*, 62. (1989)

If strategy is shaped by organizational interests, and serves as a theory of war that justifies organizational goals, what are those goals? Builder argues that the organizational identities of the military services “are the products of the culture and acculturation of hundreds of thousands of people, whose leadership requires decades of institutional experience, and whose behavior is continuously reinforced by social and professional incentives.”⁶⁶ Builder’s key insight regarding the way in which individuals come to identify with their jobs and the tools of those jobs, discussed above, bears profoundly on the research study. Individuals identify with their tools and missions: they derive a sense of identity, pride, and worth from carrying out their missions and using their tools. In military organizations, the heightened sense of mission amplifies this process. In DoD, there are numerous suborganizations that are specifically tasked with providing fuel support. Any effort to reduce petroleum consumption directly challenges the mission and identity of the fuel logistics program.

Interview data support this thesis. It is logical: those who are tasked with ensuring that enough fuel reaches its destination on time rightfully take pride in their achievements and a sense of value in their important mission, the execution of which is absolutely critical to the success of any military operation. Efforts to reduce petroleum consumption must account for the natural cultural resistance of parts of the organization that are threatened by such change. Interview data supported the conclusion that logistics programs were a source of resistance to efforts to reduce petroleum use.

A key argument advanced by the office of operational energy is that reducing the energy footprint of military operations offers real benefits: that pursuing a strategy of reducing operational energy results in better, more effective warfighting. Reducing energy needs, they argue, make troops lighter, with more freedom of movement and less exposure to vulnerable supply lines. Troops are more “sustainable”, and can “linger” longer in theaters of operations without the need to resupply.

Light, nimble, endurance operations characterize current and future scenarios as the U.S. continues to combat non-state terrorist/insurgent organizations in remote locations. As such, steps to bolster these operational aspects offer strategic payoff. Given the asymmetry between U.S. military forces and non-state foes, terrorist/insurgent groups naturally focus effort against vulnerable supply lines. Fuel and water are necessary, bulky, and heavy supplies, and the trucks that carry them are confined to easily identifiable road systems: therefore they are tempting targets for the rudimentary explosives-based attacks often employed by insurgents. Truck convoys, one senior DoD official noted, are “large slow reflective targets”. Although the U.S. is rightly proud of its ability to “push fuel through” to the front lines, the ability of insurgents to “counter” that blurs the line between logistics and combat. When attention is diverted from front-line action to defending supply convoys, difficult decisions must be made about priorities. In addition, convoy attacks affect maneuverability on the ground, the “lifeblood of ground warfare.”

⁶⁶ Builder, 38.

B. Climate change

Like energy, which is tackled by both installation/facilities programs and operational programs, climate change is also engaged along several tracks. DoD is working to protect its facilities and installations from the dangers of climate change, including storm surges, wildfires, and increased energy consumption for cooling. These efforts are known as “adaptation”, and primarily occur in the Office of the Deputy Under Secretary of Defense for Installations and Environment, (DUSD-I&E).

The 2010 Quadrennial Defense Review, which followed on the heels of Executive Order 13514, both opened the door for renewed work on climate change in DoD. One interview respondent described the 2010 QDR as a “kickoff”: “not that they weren’t doing anything” before that point, but that it is easier to make the case when high-level guidance like the QDR (reinforced by the 2014 QDR) “gives you backup”.

1. Identification of problem

Climate change is an interesting research topic in DoD because it has multiple compelling aspects: climate change will interact with other factors, including population and governance, to shape future conflicts that may require American involvement; in addition, the effects of climate change may directly impact U.S. military installations and operations, as predicted increases in powerful storms, wildfires, and water/cooling demand affect U.S. facilities at home and abroad; lastly, given its enormous size, DoD is a major emitter of compounds that affect global climate.

During the course of research, a long, robust, and fascinating history of engagement with climate science by DoD emerged. In particular, programs aimed at understanding global climate science, with the ultimate goal of controlling and weaponizing weather and climate, were supported by DoD. This history points to the interesting place of the natural world, including global climate, in DoD culture.

(a) Earliest interest in climate

Interest in the earth sciences has a long and robust history in the American military, predating the Department of Defense itself. The American military has long maintained meteorological departments to help plan operations. Both military historians and earth science historians agree on the critical role that DoD played in the development of modern meteorology in the years following WWII. The national weather service emerged from the Army Signal Corps in 1891 (Harper, 670), indicating the importance of weather data to the military. In addition, armed forces have also focused effort on geography, oceanography, hydrography, and other earth sciences.

Harper describes the development of modern computer-based weather prediction as a collaboration among meteorologists (many trained for WWII and seeking work in its aftermath) with major funding from the Navy’s Office of Naval Research. Harper also

notes that many military leaders who pushed for advanced meteorological prediction did so with the expectation that prediction would lead swiftly to control of the weather (Harper, 2003).

In addition, the US Navy has a longstanding interest in the advancement of oceanography, and has played a key role in the development of the marine sciences since the establishment of the Depot of Charts and Instruments in 1830 (Navy 1). Another outgrowth of the Depot of Charts and Instruments is the US Naval Observatory, which was formally established in 1844 and performs a variety of astronomical functions and research for military and national use (Navy 2).

Turning specifically to climate science, DoD also has a robust, yet little-known history of supporting climate science. Efforts to develop weather and climate science into weaponizable programs occurred in the middle of the twentieth century. Although classified at the time, records of these programs were accessed in the course of this research study. The papers of Harry Wexler, director of meteorological research for the Weather Bureau, provide information regarding the weather and climate modification programs at DoD.

In a 1950 interview, Francis W. Reichelderfer, the first naval officer to be made Chief of the Weather Bureau, simultaneously acknowledged awareness of global warming while pointing to DoD's true interest: climate control.

Q: Isn't it true that U.S. weather has been getting gradually warmer?

A: Our records do point to evidence that the U.S. average temperature is somewhat warmer than it was 25 or 30 years ago... We know that glaciers north of us are receding, and the gradual shrinkage of the icecaps at both North and South Poles is an accepted scientific fact... Yet we have faith that we eventually will know the weather's secrets. And then we can do something about it."⁶⁷

(b) 1990s: Greening and climate

Rita Floyd provides an excellent assessment of the securitization and desecuritization of the environment under the Clinton and Bush administrations in her 2010 book, *Security and the Environment*. Floyd notes that the environment first emerged as a national security issue in the 1991 National Security Strategy of the George H. W. Bush administration. She notes, "the single most important issue to consider is that the incorporation of the environment (along with other non-traditional security issues) into the NSS took place right after the end of the Cold War. This is no coincidence."⁶⁸ The end of the Cold War can be seen simultaneously as opening space for new conceptions of security and requiring alternative justifications for sustained defense spending—either

⁶⁷ Francis W. Reichelderfer, interview in U.S. News & World Report, 3 March 1950. In Francis W. Reichelderfer papers, box 3. Library of Congress.

⁶⁸ Rita Floyd, *Security and the Environment*. 2010. 65.

way, the Clinton administration moved aggressively to incorporate environmental considerations into its definition of national security and its security strategies.

Floyd argues, “in rhetorically drawing a connection between ‘environment’ and ‘security’ the U.S. government made a promise to U.S. citizens to protect them from threats associated with environmental change.”⁶⁹ In drawing environmental concepts like pollution, deforestation, ozone depletion, and desertification into the ambit of national security, the Clinton administration raised the profile of environmental issues and created powerful new narratives about their significance.

In the post-Cold War period, “public awareness of the environmental damage done by the military soared to previously unknown heights”⁷⁰, leading to public outrage directed at DoD. Public sentiment “forced” the George H. W. Bush administration and Secretary of Defense Cheney to embrace a new attitude towards “environmental stewardship of the military”⁷¹. One respondent remarked that environmental legislation “started to hit” DoD around 1990. In addition, rounds of BRAC in 1988, 1991, and 1993 combined base closings with environmental cleanup. According to interview data, cleanup and closing of bases was “a big deal” by 1993. The money was in base cleanup, “not climate change”, but the issues were linked by the environmental element.

However, DoD had not willingly embraced an environmental ethic. Robert Durant’s thorough analysis of this history provides a helpful guide. According to Durant:

Thus, by the time the Soviet empire dissolved in 1991, a series of presidents over the prior four decades had tried, to varying degrees and with little success, to create a corporate sense of responsibility in the Pentagon for ENR protection. Bequeathed to the post-Cold War era as a consequence was a regulatory regime that allowed the military needs of the Cold War to take precedence over ENR protection. (Durant, 36)

Initially, environmental responsibility was advanced upon the military via the courts. The environmental movement of the 1960s and 1970s generated significant federal legislation that protected air, water, flora and fauna; however, the military was reluctant to apply these laws to its own work. Rounds of environmental litigation in the 1980s that targeted DoD put the military “on the defensive” (Durant, 2007). Legal efforts to rein in DoD environmental damage increased in numbers and scale, as challengers “increasingly confederated” and occasionally joined by other federal agencies impacted by DoD installations, whether by noise, air or water pollution, or ordnance issues (Durant, 2002). However, DoD earned a reputation for fighting efforts to attach responsibility for environmental issues to military activities: Schmidt quotes a Colorado state attorney general complaint, “DoD has a consistent track record in litigation going back decades for trying to get out of its environmental requirements.” DoD most often sought to avoid environmental regulation by relying various exemptions for sovereign immunity of federal facilities (until the Federal Facilities Compliance Act of 1992), according to

⁶⁹ Floyd, 73.

⁷⁰ Floyd, 83.

⁷¹ *Ib.*

Durant. According to interview data, the endless litigation was a “stick”, that produced effects but also created adversarial relationships and climate in DoD.

In 1993, Secretary of Defense Aspin released a “comprehensive review” of DoD “defense strategy, force structure, modernization, infrastructure, and foundations”, in recognition of the massive readjustment required by the close of the Cold War⁷². The “Bottom-Up Review” recalibrated DoD towards a new security environment, one no longer characterized by the imminent threat of nuclear war with the Soviet Union, but rather oriented around the possibility of multiple regional conflicts.

“Environmental Security” comprised an entire section of the Bottom-Up Review Report. “First, our national security must include protection of the environment, and environmental concerns must be fully integrated into our defense policies. Second, to fully protect our nation, we must also have a strong economy; protecting the environment and growing the economy must go hand in hand.”⁷³

(c) 2000s: Climate on the back burner

The terrorist attacks of September 11, 2001, abruptly and totally shifted the focus of DoD, the U.S. government, and the nation. Although increased resources were available, priority was on responding to the attacks and preventing further acts of terrorism, as well as engaging new enemies.

DoD documents make clear the new priorities, as do administration statements like the National Security Strategy. Figure 2 shows the change in focus of high-level security statements, which did not discuss climate change for several years following 9/11. There are no references to climate change (or related terms) in the Quadrennial Defense Review reports of 2001 and 2006, nor in the 2002 or 2006 National Security Strategies⁷⁴, the 2004 National Military Strategy, or the 2008 National Defense Strategy. The election of George W. Bush ushered in an era of ‘desecuritization’ of the environment, which was furthered by the terrorist attacks on 9/11 (Floyd, Ch. 5). Public attention focused on Al Qaeda and the threat of global terrorism, and environmental dangers receded into the far background. The demands placed upon the US security establishment in the wake of the September 11th attacks reduced the need for alternative security narratives. In fact, the years following 9/11 saw the exclusion of climate change from security language.

⁷² DoD, Report on the Bottom-Up Review, October 1993. Message from the Secretary of Defense, iii.

⁷³ *Ib.* at 99.

⁷⁴ The 2006 NSS contains language on energy security that refers repeatedly to “clean coal” and supports the expansion of “emission-free energy”; however, there is no mention of CO₂, warming, or climate change, and there is no explanation of what sort of emissions are avoided (see pp. 28-29 for energy security section).

Although some work was being done to advance security responses to climate change⁷⁵, the issue did not penetrate to high-level security documents.

Climate change was also marginalized by the publication in 2003 of a hysterical DoD report envisioning a world turned upside down by rapid climate change. “An Abrupt Climate Change Scenario and Its Implications for United States National Security”, took its inspiration from the rapid climate shifts found in the paleoclimatic record, and painted a picture of dystopia:

As global and local carrying capacities are reduced, tensions could mount around the world...Nations with the resources to do so may build virtual fortresses around their countries, preserving resources for themselves. Less fortunate nations especially those with ancient enmities with their neighbors, may initiate in struggles for access to food, clean water, or energy. Unlikely alliances could be formed as defense priorities shift and the goal is resources for survival rather than religion, ideology, or national honor. (Schwartz and Randall, p. 2)

This oft-cited report drew wide attention within the security establishment, but its admittedly “extreme” scenario appears to have pushed the issue of climate change further to the fringe of the security community, reinforcing administration-level silence on the issue.

Interview data indicate that the topic of climate change was unwelcome in the building during the George W. Bush administration. Given pressing priorities related to conflicts in Iraq and Afghanistan, as well as the ongoing effort to combat global terrorism, this de-emphasis on climate is unsurprising.

By the end of the second George W. Bush administration, climate change was re-emerging as a policy issue. The 2008 National Defense Strategy noted that environmental and climatic pressures could interact with global demographic trends to create new security challenges (NDS, 2008, p. 4-5). The NDS argues that defense policy “must account for these areas of uncertainty” and notes the “need to tackle climate change” (NDS p. 5)

Although no specific policy window or crisis served as a powerful driver of attention, the increasing drumbeat of attention, combined with the efforts of key elements in Congress, advanced climate policies that affected DoD.

(d) Current engagement with climate

Recent years have seen the widespread penetration of climate change into security statements and language.

⁷⁵ For example, in 2001 the Oceanographer of the Navy, the Office of Naval Research, the Arctic Research Commission, and the Naval Ice Center co-sponsored a symposium on naval operations in an ice-free Arctic. These offices have longstanding interest in earth and climate science.

The DoD Defense Installations Strategic Plan (2007) lists Objective 4.3: “Reduce reliance on fossil fuels to meet facility and non-tactical vehicle energy requirements.” The priorities listed include shifting towards renewable energy, both purchased and generated on-site; reducing energy use; focus on lifecycle energy costs; and using aggregate bargaining power to reduce energy costs (DISP). Specific installation-specific actions include building retrofits, high-efficiency HVAC systems, double-pane windows and efficient lighting, new roofs, and energy management control systems (DoD Scorecard Narrative 2012).

2008 saw the publication of a National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030 (National Intelligence Council)⁷⁶. This report, which grew out of a National Intelligence Priorities Framework review in 2006, addressed the national security significance of future climate change. “It had obviously become an important global issue”, according to Congressional testimony by Dr. Thomas Fingar of the National Intelligence Council⁷⁷.

The 2010 Quadrennial Defense included the issue, even in the executive summary: “Climate change and energy will play significant roles in the future security environment. The Department is developing policies and plans to manage the effects of climate change on its operating environment, missions, and facilities.”⁷⁸

In 2009, President Obama issued Executive Order 13514, directing federal agencies to reduce their energy, water, and waste footprints, as well as to shift procurement towards sustainable and environmentally preferable technologies, designs, and materials. Performance evaluation was a key element of this effort, as the EO called for “continuous improvement” through regular reassessment and transparent disclosure. In addition, Executive Order 13514 also directed federal agencies to reduce energy intensity, increase use of renewable energy, reduce carbon inputs, alter supply chains and staff travel activities to reduce carbon intensity, and achieve zero net energy in new federal buildings by 2030. This Executive Order also tasked the Office of Management and Budget with preparing periodic scorecards to evaluate the progress of federal agencies towards these goals. The 2011 DoD Strategic Sustainability Performance Plan (DoD SSPP) accepted this challenge: “The Department not only commits to complying with environmental and energy statutes, regulations, and Executive Orders, but to going beyond compliance where it serves our national security needs.”

In 2011, a DSB report, “Trends and Implications of Climate Change for National and International Security”, was published. This report advanced pragmatic reasons for DoD involvement in climate change.

⁷⁶ National Intelligence Council

⁷⁷ “Statement for the record of Dr. Thomas Fingar, deputy director of national intelligence for analysis and chairman of the National Intelligence Council, before the Permanent Select Committee on Intelligence and the Select Committee on Energy Independence and Global Warming”, U.S. House of Representatives. June 25, 2008. (Available at www.fas.org)

⁷⁸ QDR 2010, xv.

Climate change has the potential for significant impacts on all three of the basic elements important to national and international security—defense, diplomacy, and economics...the most immediate effects with the highest potential for instability will come from the most vulnerable regions of the world where the United States obtains vital fuel and strategic mineral imports and combats terrorism.⁷⁹

The penetration of climate change into security strategy and policy raises questions about how this issue fits with the organizational characteristics, culture, and strategic orientation of DoD. Can any lessons be drawn from the process whereby climate emerged as a security issue?

2. Organizational characteristics

Unlike POL consumption and dependence, which has a long and mixed record, the problem of climate change is more recent and is uncharacterized by recurring crises. As a problem largely of the future, climate change has not had compelling policy windows opened by highly visible, forcefully present crises that mobilize public attention, like the energy crises of the 1970s or the wave of fuel convoy attacks in Iraq.

The effects of increasing concentrations of heat-trapping gases in the earth's atmosphere, most notoriously carbon dioxide, methane, and the fluorinated gases (CFCs, HCFCs, halons), are a matter of scientific study. As such, this issue aligns very well with the longstanding interest on the part of DoD in earth sciences.

However, "climate change", or "global warming" as an issue, has become a hotly politicized topic—if not the most divisive, surely on the short list of contentious issues dividing the American public and policymakers. The effects of this politicization have complicated DoD's process of engagement with the issue.

In addition, the organizational commitment of DoD to focusing on the military mission means that efforts to engage DoD on climate must closely link the science to the mission.

(a) Connecting climate to military mission

Interview results indicate that the connection between climate change and the DoD mission must be adequately demonstrated: "If you're solving for climate change, why would you use DoD?" The causal chain between climate and conflict was not the entry point for climate programs at DoD at first; rather, climate programs grew from environmental protection efforts, including ozone protection and base remediation.

Floyd argues that the idea was advanced that, "the mistreatment of the environment by the DOD leads to environmental security *threats*" (emphasis added)⁸⁰. Environmental

⁷⁹ DSB, Trends and Implications of Climate Change, 2011. Exec. Summary, xii-xiii.

⁸⁰ Floyd, 84.

policies in this era focused on how the military “could change its image from being essentially a destroyer of the environment”, instead becoming “a good steward of the environment”, cleaning up contaminated bases and “in that way ensure military readiness”⁸¹.

The creation of the Office of the Deputy Under Secretary of Defense, Environmental Security, marked an important step in the securitization of the environment. Floyd notes that this office largely served to consolidate and centralize preexisting programs relating to environmental issues, raising the profile and hopefully improving the execution of environmental programs⁸². The DoD Strategy for Environmental Security mission statement identified three types of environmental security threats: (1) “global”, including “warming; ozone depletion; loss of biodiversity”, etc.; (2) “regional”, including “environmental terrorism, accident, or disaster; regional conflicts caused by scarcity/denial of resources”, etc.; and (3) “national”: “risks to public health and the environment from DOD activities; increased restriction of military operations; inefficient DOD resource use; reduced weapons system performance; demilitarization of nuclear, chemical, and conventional munitions; and erosion of public trust.”⁸³

DoD Directive 4715.1, 24 February 1996, established policy for environmental security within DoD:

It is DoD policy to display environmental security leadership within DoD activities worldwide and support the national defense mission by:

4.1 Ensuring that environmental factors are integrated into DoD decision-making processes that may have an impact on the environment and are given appropriate consideration along with other relevant factors.

4.2 Complying with applicable United State statutes, regulations, Executive orders...

4.3 Protecting, preserving, and, when required, restoring, and enhancing the quality of the environment.

4.4 Reducing risk to human health and the environment by identifying, evaluating, and where necessary, remediating contamination resulting from past DoD activities.

4.5 Preventing pollution and minimizing adverse environmental impacts.⁸⁴

The list continues, but the examples above illustrate the basic fact that the conception of environmental security put forth by the Clinton administration simultaneously charged DoD with protecting the environment and implicitly accused DoD of contributing to environmental security problems.

⁸¹ Floyd, 86.

⁸² Floyd, 88.

⁸³ DoD Strategy for Environmental Security (1993), unpublished mission statement. Reproduced in Floyd, *Security and the Environment*, courtesy of Deputy Under Secretary of Defense for Environmental Security Sherri W. Goodman. 89.

⁸⁴ Department of Defense Directive 4715.1. 24 February 1996.

The Bottom-Up Review Report provides further evidence for this conception of environmental security:

Environmental concerns are an integral part of U.S. national security policy because of the effect that environmental conditions have on economic and political stability, because of the growth in environmental costs as a share of the national security budget, and because of the loss of public trust caused by military noncompliance with environmental laws and regulations.⁸⁵

More broadly, this approach to environmental security issues reinforced the interpretation that environmental issues necessarily were opposed to national security issues; that protecting the environment or conserving fuel were done at the expense of military readiness or mission. “We will continue to provide leadership in balancing environmental protection and national security. Climate change is no exception.”⁸⁶ This statement, from Deputy Under Secretary of Defense, Environmental Security, Sherri W. Goodman, reflects the conception of environmental interests, including climate, being balanced *against* national security.

Therefore, although the latter part of the 1990s saw attention and resources devoted to environmental issues, including the emerging issue of climate change, environmental issues were not always perceived as directly advancing the military mission. This limited their implementation and effects on DoD culture.

(b) Politicization of climate

Figure 2 tracks the discussion of climate change in high-level security documents in the post-Cold War period. During the 1990s, as Vice-President Gore championed the issue along with other visible advocates, climate change became a high-profile issue. In 2006, Al Gore released *An Inconvenient Truth* in book and film format, tightly linking the issue of climate change with the Democratic political party. Along with increasing partisan activity in the early 21st century, “global warming” emerged as a divisive political issue.

⁸⁵ DoD, Report on the Bottom-Up Review, October 1993. 99.

⁸⁶ U.S. DoD: Climate Change, Energy Efficiency, and Ozone Protection: Protecting National Security and the Environment. DUSD-ES. November 2000.

NSS	PR 1993	PR	PR	PR Kyoto	Yes	No		No		Yes	
QDR				No 1997		No 2001		No		Yes	
Other							No		PR		
	1992	1994	1996	1998	2000	2002	2004	2006	2008	2010	2012

Figure 2: Discussion of climate change (or related terms) in National Security Strategy (President), Quadrennial Defense Review Report (DoD) or other high-level security documents 1992-2012. Democratic administrations are highlighted in blue, Republican in red. PR= passing reference.

An analysis of party platform language relating to climate change from recent presidential campaigns reflects growing polarization on the issue:

	Republican	Democrat
2012	“We oppose any and all cap and trade legislation.”	“We know that global climate change is one of the biggest threats of this generation—an economic, environmental, and national security catastrophe in the making.”
2008	“Republicans caution against the doomsday climate change scenarios peddled by the aficionados of centralized command-and-control government.”	“We understand that climate change is not just an economic issue or an environmental concern—this is a national security crisis.”
2004	“Republicans are committed to meeting the challenge of long-term global climate change by relying on markets...Our President and our Party strongly oppose the Kyoto Protocol and similar mandatory carbon emissions controls that harm economic growth and destroy American jobs.”	“Climate change is a major international challenge that requires global leadership from the United States, not abdication.”

Figure 3: Planks on climate change from Republican and Democratic party platforms from recent election cycles. Source: American Presidency Project, University of California, Santa Barbara, and www.GOP.com (only 2012, GOP).

Increasing political divisions were reflected in public opinions over climate change, which began to fragment along political lines: “Since the early 1990s a bifurcated flow of information has existed for the issue of global warming.” (McCright and Dunlap, 2011). The political parties are on either side of the issue, and the American public can choose information that corresponds with particular political beliefs and positions. McCright and Dunlap’s data indicate, “Political elites selectively interpret or ignore new climate change studies and news stories to promote their political agendas”, and locate this politicization between 2001-2010. They also have found increasing polarization between Republicans and Democrats on the issue of climate change (along with other environmental problems).

3. Cultural

Climate change also interacts with DoD and military culture, which displays potentially important values towards the environment.

(a) History of earth sciences across U.S. military: control of nature

With a long history of incorporating environmental conditions into planning, tactics, and strategy, the US military is naturally attuned to the various environments in which it operates around the world. Training and education have long emphasized knowledge of geography and climatic conditions, and the military has invested in advancing a variety of earth sciences in order to gain a more thorough understanding of, and perhaps advantage in, the theaters of war.

The power of environmental conditions to affect military operations has made the study of nature (and still is) a critical element of warfighting. The American military has devoted enormous effort towards understanding this enemy, with an ultimate aim of controlling weather and climate that has percolated near the surface for decades. In 1961, DoD announced, “Department of Defense has a vital interest in the environmental sciences since the military services must have an understanding of, and an ability to predict and even to control the environment in which it is required to operate...” (DoD, International Scientific Activities, quoted by Doel, 2003).

Various programs to modify and weaponize weather and climate were put on by DoD. Records from these programs demonstrate a passionate, cultural fascination with subduing and controlling weather and climate.

In an address from 1961, Admiral Luis de Florez waxed enthusiastic about the possibilities of controlling weather and climate:

With control of the weather the operations and economy of an enemy could be disrupted and by the same token we could be made to suffer enormous losses...and our military efforts crippled. In a Cold War the ability to control or modify weather would provide a powerful and subtle weapon...We must realize that weather control or modification, like

nuclear energy, involves world problems...Nevertheless, the control of global climate and weather must eventually be tackled even though it be fraught with danger...perhaps most of all, because man will never stop harnessing the forces of nature to his use.⁸⁷

In the 1970s, ARPA funded a secret research program code-named NILE BLUE, which attempted to develop tools for global climate modification (Hecht and Tirpak, 1995). NILE BLUE followed on the heels of attempted local climate manipulation in the Vietnam conflict, when DoD seeded clouds over the Ho Chi Minh Trail in an effort to bog down resupply. As Deborah Shapley detailed, the \$21.6 million, 7-year program began in 1966 with operations in Laos and was later expanded to the north and south (Shapley, 1974). These programs were elements of broader research into climate by DoD⁸⁸.

(b) Ambivalence of military orientation to nature

Environmental issues are seen as peripheral to the military mission, at best. One interview respondent shared the insider derogatory nickname, “bugs, bunnies, and bones” that is used to refer to environmental (and cultural) protection programs.

The military desire to control nature, born out of the overwhelming significance of environmental factors to operational outcomes, was discussed in the previous section. Broadening our analysis, there is another cultural factor, one that is deeply tied to the American national culture, that shapes DoD engagement on environmental issues, including climate change. This is a deeply ambivalent orientation towards the natural world.

The first European settlers on the North American continent were forged in a Christian tradition that equated wilderness with evil. The wild, untamed continent had to be subdued and civilized, including its native inhabitants. “What could they see but a hideous and desolate wilderness, full of wilde beasts and wilde men?...the whole country, full of woods and thickets, represented a wilde and savage hew.”⁸⁹ Udall concluded, “There was a continent to be redeemed from the wilderness”.⁹⁰

American culture, and military culture as well, reflect an orientation towards domination and control of nature. The ability of natural phenomena, like adverse weather, to determine the outcome of military operations, makes the environment both powerful and inscrutable. As such, it is a logical target of attempts to assert power.

⁸⁷ Address by Adm. Luis de Florez before IAS, New York, January 1961. Harry Wexler papers, box 35. Library of Congress.

⁸⁸ For further information on DoD weather modification, see also Hart and Victor (1993).

⁸⁹ Udall, *The Quiet Crisis*. Quoting Nathaniel Morton, the record-keeper for Plymouth Colony. 13.

⁹⁰ *Ib.* at 10.

4. Strategy

The cultural values discussed above translate into a strategic orientation towards the natural world that reflects the importance of environmental conditions to operational effectiveness, and the ambivalence this importance produces.

(a) Importance of environment to military mission

The significance of nature to military strategy is fundamental and far-reaching, which is why it has penetrated to the culture so strongly. Its very fundamental relationship perhaps serves to obscure its importance, as it is very often overlooked.

Clausewitz identified the importance of nature in war and strategy, in his discussion of “friction”, the key concept to which he devotes extended attention. Friction has already been discussed in section 5(A)(4); it is the cause behind the fact that “everything in war is very simple, but the simplest thing is difficult”⁹¹. Clausewitz pointed to nature for examples of friction: “Fog can prevent the enemy from being seen in time, a gun from firing when it should, a report from reaching the commanding officer. Rain can prevent a battalion from arriving, make another late by keeping it not three but eight hours on the march, ruin a cavalry charge by bogging the horses down in mud, etc.”⁹²

Admiral J. C. Wylie’s writing on strategy also make clear the significance of the environment to Army operations in particular: “Prominent and direct in its effect is the fundamental fact of terrain...to the soldier it is everything...It is the opponent that he must always face no matter who may be his enemy.”⁹³

Therefore, any attempts to introduce environmental conservation or protection into DoD strategic values, culture, or organizational operations, must take careful accounting of the fundamental orientation of the U.S. military and DoD towards the environment. The environment, when framed as a victim of the military, does not arouse undue sympathy, since warfighters may perceive themselves as victims of capricious nature. This attitude, born of centuries of experience slogging through adverse environmental conditions during combat conditions, must be recognized and appreciated, and environmental programs, including climate, tailored to fit.

6. Conclusions

At the close of the study, it is possible to identify several key findings. Some of these are organizational characteristics that have affected the emergence, implementation, and outcomes of energy and climate-focused policies. Others are elements of the culture of

⁹¹ *On War*, Howard and Paret eds. and trans. 119. (1976)

⁹² *Ib.* at 120.

⁹³ Admiral J. C. Wylie, *Military Strategy* (1967). Quoted in Builder, *Masks of War*, 88. (1989)

DoD and/or the military services. The highest-level analysis points clearly to a fundamental reorientation of military strategy in the new security era.

A. Energy

One of the primary findings of the research project was that current efforts to reduce the DoD energy footprint can be seen as simply the latest iteration of efforts that have emerged and retreated at intervals throughout DoD history, in response to recurrent crises. The first period, immediately in the wake of the second World War, was stimulated by the outsize importance of POL to the war effort and the impending switch of the U.S. from net oil exporter to importer. The second period, in the 1970s, resulted from the fuel crisis and emergence of OPEC. Neither of these periods of policy reform proved longstanding or thorough-going; in fact, the efforts were wound down quickly as oil prices dropped.

Evidence indicates that efforts to reduce petroleum consumption are triggered by crises, when a “policy window” opens and change can be implemented. However, the cycle of policy development and implementation is slower than price variability in the petroleum market: efforts to reduce consumption have been stymied in the past by falling world oil prices. When prices spike, the crisis spurs interest in addressing the problem; when prices fall, interest turns elsewhere. The policy cycle moves more slowly than oil prices: although a policy window may be opened by price or supply problems, in the past these windows have closed too quickly. This pattern lends credibility to the efforts by the OE office to tie their efforts to military effectiveness rather than cost savings. Although interest in energy may be fleeting, DoD maintains unwavering focus on the military mission; therefore, tying energy programs to military effectiveness represents a key insight as well as an example of organizational learning.

This research points towards the conclusion that the place of logistics in military strategy, culture, and DoD organization needs to be rethought to better orient us for the current and future security environment. Increasing platform energy consumption, combined with the realities of asymmetric warfare, as well as the increased emphasis on the Pacific region, all point towards a future in which POL demand will increase. Along with increasing demand come increasing liabilities: attacks by enemies on supply lines; the continued variability in petroleum prices; the long distances of the Pacific and likely theaters in the African continent. Logistics has long been overlooked by strategists, including within DoD; this has been enabled by the effectiveness of the agencies responsible for delivering fuel and supplies. One interview respondent asked, “What is our success hiding?”: the remarkable effectiveness of DLA hides the problem of energy consumption.

During the course of this study, the question arose whether current efforts to address energy consumption would fade away like previous generations of energy policy. If petroleum prices dropped, or if the ongoing U.S. energy boom reshaped global petroleum markets, would these efforts be sustained, or die out? This question was posed to interview subjects, who unsurprisingly reflected optimistic outlooks. However, some conclusions may be drawn about the likely future course of current policy. The emphasis

by the OE office on connecting energy efficiency with military effectiveness is a key breakthrough that refocuses the terms of the debate and points towards a more durable change in DoD culture, strategy, and organizational behavior relating to POL and energy.

B. Climate

In contrast to the energy problem, tackling the issue of climate change in DoD is a far better “fit”. The hiccups in engagement on this issue appear to have stemmed in large part from the politicization of the issue of climate, as well as the association between climate and DoD-targeting environmental programs.

The politicization of the issue of climate change further complicates its incorporation into security language. Once an issue has been politicized, discussing it is a political act with potentially dangerous ramifications. Climate change has unfortunately become a focal point of partisan disagreement, which has complicated its incorporation into national security strategy and planning. The effects of this delay are unknown but unlikely to be beneficial.

Climate change may be caused by emissions; DoD may be a large emitter. However, DoD has only grudgingly and slowly accepted that it must take responsibility for the side effects of its mission, including environmental impacts. During times of crisis, DoD still is able to violate environmental laws, in recognition of the overwhelming importance of successful national defense. Therefore, efforts to address climate change through connecting it to burdensome environmental programs seen as of secondary importance to the military mission limited success.

Climate change, however, as connected to the reasons why and the circumstances in which the U.S. military may be fighting, is directly connected to the DoD mission. In addition, integrating climate considerations into military planning, strategy, and operations builds upon a long history of carefully studying the natural world. In addition, engaging with climate change as a military consideration fits with DoD culture, which contains elements of antipathy towards and a desire to control the environment.

Therefore, although climate change may seem to be a major new challenge for DoD, it integrates easily with the top two layers of our model: strategy and culture. The process of bringing climate change into the DoD organization was hampered by political factors, but it can be expected that climate will become more and more strongly integrated into DoD strategy, culture, and organization.

7. Recommendations

The histories of energy and climate in DoD can be reviewed for learning outcomes. Although simple, the points below received support from interview and archival data, indicating that they should be considered as tangible recommendations for ensuring a more effective response to global environmental change within the DOD:

(1) Enable environmental issues in the context of DOD culture, while engaging with the cultural inertia within DOD; Internal directives within the DOD should engage with the issue of organizational inertia more directly. There are two aspects of this a) Energy policy within DOD is focused on the military effectiveness outcome and fuel efficiency often gets discounted because of a security imperative. However, there are win-win outcomes which could be better communicated on about how efficiency can not only protect the mission but advance it. ii) Climate change is different from the energy discourse in DOD and was introduced in the 1990s as a particular directive to address criticism from environmentalists at a time when there was tension with the civilian government's agenda in this regard. The Climate change imperative could have been addressed more carefully by aligning with the military mission on preventative security and disaster risk mitigation earlier on rather than through a inculcation of general conservation stewardship.

(2) Consider the role of data more directly in making connections between environmental action and military effectiveness. All too often environmentalists have focused on environmental impact data rather than providing data to make the case for military effectiveness with conservation. The Operational Energy Office is focused on efficacy rather than efficiency and clear data needs to be provided to make a cogent link between the two metrics. For example, shrinking the logistics chain particularly in irregular warfare can be better achieved through conservation policies and the data to support such an approach is likely to be more effective in spurring a change in behavior.

(3) Study the organizational characteristics of DoD that relate to environmental security: The complexity of organizational hierarchy and the various units where environmental issues may be deliberated needs to be better organized and harmonized. For example, the acquisitions process organization is highly sensitive to hierarchy and commitments made to the military leadership. Understanding the chain of command in this context is essential ensuring environmental directives get adopted. The position of assistant secretary for environmental security existed for a time but was subsequently absorbed within a remediation office in recent years. Understanding the dynamics of such organizational changes needs to be revisited to see if there may be an opportunity for more timely responses to global environmental stresses.

(4) Link environmental imperatives directly to DoD budgets, planning, and acquisition processes; The time horizon for budgeting of different parts of the DOD has a major impact on how initiatives get adopted and its endurance over several years needs to be recognized. For example the acquisitions process is a long-term cycle and the key performance parameters (KPPs) need to be better recognized when bringing forth environmental performance indicators.

(5) Consider various services of the armed forces individually for environmental response action: Given the size of the armed forces, each branch has its own specific modus operandi to approaching security problems and there should be greater nuance and a willingness for environmental initiatives to adapt accordingly. The Operational Energy

Office appears to be following this guidance by providing flexibility in the services drafting their own energy strategy. Civilian governments which come in with new initiatives should understand the need to have an adaptive approach for the various services concerned.

8. Next Steps & Acknowledgements

A. Publication Plan

Over three years, the research study covered a wide range of theoretical, historical, and governmental material. Having amassed a large data set and identified key conclusions, much remains to be done: publishing and disseminating the findings of the study, and following up on additional lines of inquiry.

The current publication plan is as follows:

Completed:

“United States Department of Defense and the Challenge of Climate Change: An Inquiry into Organizational Adaptation and Resilience”, dissertation by Rebecca Pincus, completed October 2013.

In Draft:

“Weaponizing weather: climate and weather modification by the U.S. Department of Defense”; proposal submitted to 2015 Society for Military History conference

“Organizational culture: relevance to U.S. Department of Defense effectiveness”; draft version

“Climate change in U.S. party platforms: a widening rift”; draft version

Proposed:

- Treatment of supply factors in war-gaming
- Post-WWII energy policy and U.S. military
- DoD and the energy crises of the 1970s
- Rethinking military logistics in new security era
- Culture of nature in U.S. military

In addition, a book proposal has been developed that would integrate research findings into broader discussion of the DoD organization, culture, and strategy for energy and climate.

B. Thanks

This research study would not have occurred as it did without the strong support of the Minerva research program, Army Research Office, and Department of Defense. Everyone who has participated in this study is grateful for this support and vote of confidence in the importance of the research.

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APPENDIX: Final Paper by Minerva Intern Patrick Leous (January 2014)

The US military is in the process of developing micro-grids as a security strategy to store energy and make it available as well during crisis situations. This short research monograph by the Minerva intern provided a sharp focus of research synthesis on this adaptation strategy for the project.

Microgrids

Microgrids are efficient and sustainable energy systems that permit a facility to operate in unison with, or independently from the utility grid. Microgrids use distributed generation technology, which combines a variety of different renewable energy sources that, together, provide the required amount of energy needed to sustain a particular building complex. Implementing a microgrid will provide a multitude of benefits. A microgrid facility has the ability to be immune to changes in fuel and electricity costs, leading to significant financial savings in the long term. In addition, implementing a microgrid allows for control over the efficiency and dependability of the power supply (“The Microgrid Concept”). This creates a great degree of resiliency against emergency power blackouts and failures. When compared with the option of relying on the utility grid for a constant supply of energy, a microgrid is clearly the most sustainable, dependable, and long term cost efficient option. Microgrids are a sustainable, energy efficient, resilient, reliable, and economically viable way to supply power to a facility or compound.

Traditionally, if a building or facility requires a constant flow of electricity in order to operate it is connected to the electric utility grid via power lines and cables. A centralized approach to energy generation has been the norm throughout history ever since the modern industrial revolution began in the late 1700’s. In this centralized model,

energy is generated at a specified location, typically close to the natural resources which are required for generation (Momoh & Meliopoulos, 2012). The natural resources most commonly used for generation in the United States are fossil fuels. These include coal, natural gas, and oil. In some cases solar, wind, geothermal, and hydroelectric sources are used as well. Generally, energy generation facilities are located far away from population centers. Energy is generated and fed into the electrical utility grid, also known as the transmission and distribution (T&D) grid. From here, the utility grid distributes energy as needed through a vast system of power plants, electric stations, and transformers. Centralized energy generation facilities are designed with resource utilization in mind and in a location specific manner. They are not planned using an overarching systems lens, instead they are one time projects designed to take advantage of a stock of natural resources in order to provide a supply of energy (Momoh & Meliopoulos, 2012).

The main disadvantage of relying on centralized energy sources is susceptibility to power loss. Energy security threats such as natural disasters and terrorist attacks are extremely unpredictable. The national electric grid is vulnerable to threats, and cannot guarantee a constant supply of power at all times (“The Microgrid Concept”). For entities such as hospitals and military organizations, losing power is detrimental to operating effectively. Relying on a centralized power source is a bit like placing all of one’s eggs in the same basket, certainly a risky strategy. Diversifying the sources from which a given facility draws its energy from is an effective strategy towards increasing energy security and resiliency against energy security threats. Microgrid systems which employ distributed generation models are very effective in meeting energy demands through the

utilization of a wide range of different energy sources such as solar, wind, and hydroelectricity.

Distributed generation is the process of producing the required supply of energy needed to sustain a given facility by means of a diversified on site energy generation system ("Introduction to Distributed Generation"). A localized energy generation facility that uses distributed generation is also known as a microgrid. The electrical load for a facility's is the amount of energy required to sustain that facility. By integrating a microgrid system that can supply the energy needed by a facility, the electrical load for the facility can be satisfied by on site energy sources. If a facility requires a microgrid system that will supply all of the energy required to meet the electrical load, the microgrid must be designed using a systems lens and employ a diverse range of economically viable renewable energy sources (Lasseter & Piagi, 2006).

A microgrid has two essential components, the microsource(s) and the static switch. The microsources are the individual energy sources, such as solar and wind, that combine to supply the energy for a facility's electrical load. Each microsource is equipped with an inverter so it can be connected to the electrical system within the microgrid. The static switch is a device that allows the microgrid system to connect and disconnect to the external utility grid. The advantage of a static switch over a traditional contractor is the simple design of the static switch (Lasseter & Piagi, 2006). The static switch has no moving parts allowing for much simpler operation than a contractor. It is not always necessary to disconnect the entire microgrid system from the utility grid. Typically, only sensitive microsources are disconnected during power faults. When the electrical utility grid experiences failures and outages, specific parts of the microgrid can

be isolated from the utility grid. This allows the microgrid to protect itself from any loss of power and to sustain itself during the power outage. In order to reconnect to the utility grid, a microgrid equipped with a static switch can utilize the electrical frequency difference between the independent microgrid system and the electrical utility grid. This allows for an oscillation (power surge) free transition back to the utility grid without having to deal with complications like frequency and phase angles at the point of connectivity (Lasseter & Piagi, 2006).

Each microsource within the system is connected using a plug-and-play and peer-to-peer model, allowing for individualized control over each energy source. The peer-to-peer method prevents any one microsource from becoming an essential part of the microgrid system, ensuring that the microgrid can operate even after the loss of an energy source (assuming that another source is substituted to help meet the electrical load). The plug-and-play model permits the system to function properly with the addition/substitution of one microsource for another at any given point throughout the entire system (Lasseter & Piagi, 2006). The concept of plug-and-play allows for a system to be designed to maximize efficiency based on the unique requirements and features of any given location.

In order to successfully meet a facility's electrical load, a microgrid system can implement a battery storage unit to collect excess energy for use during utility grid failures, or for use during periods when energy sources are experiencing low electricity generation. Aqueous Hybrid Ion (AHI) is a type of battery that has been recognized by the U.S. Department of Energy as a viable option for renewable energy storage ("Sodium-ion batteries," 2012). These batteries have been noted as having a long life

cycle (10 yrs.), low environmental impacts (due in part to nonvolatile components), and have a low electrical cost ("Sodium-ion batteries," 2012). AHI batteries are an efficient and environmentally conscious way to store excess energy in a microgrid system.

Deciding on the various types of renewable and possibly non-renewable energy sources that will serve as microsources within a microgrid is a very important step towards ensuring that electrical loads are satisfied. Currently, some of the most common types of microsources in microgrids are wind turbines, Photovoltaic solar panels, vehicle to grid technology, and biogas generators (Sanchez). Cogeneration, or combined heat and power, is a strategy that permits the simultaneous generation of heat and electricity. Cogeneration is not an energy technology in and of itself, it is a system of integrated energy technologies designed around the specific needs of the larger microgrid system (Sanchez).

Due to the inconsistent nature of certain renewable technologies such as solar and wind (UV rays and wind are intermittent and sometimes unpredictable), energy generation from these sources can only provide a portion of the energy that is required to meet a facility's electrical load. For this reason, a wide range of renewable energy sources must be used ("Innovate: The power of microgrids", 2013). Depending on the system criteria laid out by the facility implementing the microgrid, non renewable energy sources or reliance on the utility grid may be used where renewable energy sources fall short. Whenever it is possible, renewable energy sources should be used due to the fact that they are self sustaining and do not rely on man-made systems to successfully generate energy. Using non renewable technology or relying on the utility grid to help meet the electrical load in a microgrid system can compromise the system's ability to be

resilient from energy security threats (“Innovate: The power of microgrids”, 2013). If a microgrid system is reliant on the utility grid or a technology such as a petroleum generator, a power outage, or a shortage in petroleum supply could interfere with the systems ability to successfully meet the electrical load as well as increase the financial costs of the system. Solar and wind technology can provide a significant amount of energy with a relatively low maintenance requirement and low emissions.

Solar hot water systems provide a more energy efficient and sustainable way to generate hot water than traditional electrical hot water systems. Vehicle to grid technology allows for electric vehicles to be plugged into the grid and provide an energy source for the microgrid to draw power from. This allows for energy from external sources (an at home car charging station for example) to be brought into the microgrid, without having to draw that energy directly from the electrical utility grid (Sanchez). Waste to energy technology generates fuel from solid waste, and natural waste (I.E. food, sewage, animal). These waste streams are gathered into closed bioreactors and the gas that is emitted as the wastes decompose can be collected and burned as fuel in gas and micro turbines, producing useable electricity (Sanchez). If a facility is located near an ocean coastline with a high tidal variation, tidal energy may be implemented into a microgrid system. Tidal energy utilizes the kinetic movement of the ebbing and flowing of ocean tides. All of the aforementioned renewable energy technologies and strategies have their strengths and weaknesses. However, when integrated carefully into a microgrid system that has been designed from a systems lens, these energy technologies can successfully meet a facility’s electrical load. Even if one of the microsources fails, the microgrid system can be designed to switch to backup energy source (a microsource

substitute) or an emergency battery bank. If a microgrid is designed to only meet a part of a facility's electrical load, or if an emergency scenario takes place and parts of the microgrid are rendered useless, the remaining energy required can be attained from the electrical utility grid or a reserve battery bank (Lasseter & Piagi, 2006).

While the concept of an independent energy island may sound intriguing, it is important to remember that no system is perfect. Unforeseen failures can become a problematic reality, and depending on how resilient a microgrid system is designed, it may need to rely on the external electric grid or non-renewable energy sources (coal/petroleum) in certain circumstances. It is advantageous for both the microgrid owner and the electrical utility grid to have microgrid systems linked to the utility grid ("Interconnection Process"). Not only does being linked to the grid allow a microgrid the possibility to acquire energy during a system failure, but it also allows for the microgrid owner to benefit financially by selling excess power back to the electrical utility. The electrical utility benefits because independent microgrids help to supply some, albeit a small amount, of the energy required to meet the electrical load of the utility grid. In many states throughout the U.S. it is required that all microgrids that are connected to the electrical utility grid comply with the Interconnection Tariff and complete the Interconnection Process. The Interconnection Tariff states the requirements, circumstances, and time slots included in the Interconnection Process, protect the utility grid from any adverse effects that a microgrid system might possibly have on the quality or security of the external utility grid ("Interconnection Process").

One of the main reasons that microgrids and distributed generation systems are becoming more and more feasible is economic cost. Traditionally, centralized electrical

generation facilities were created to utilize economies of scale based on a location specific manner. An economy of scale is the monetary gain that results from increasing the overall output of a given product or good. The reason for this monetary gain is due to the connection between the number (overall volume) of products produced, and the fixed cost required to create each good (“Economies of Scale”). In an economy of scale, increasing production lowers the individual cost of each unit produced. In the case of centralized generation facilities, prior to the 1960’s it was beneficial for electrical generation facilities to ramp up production in order to reduce generation costs and generate more profit overall. However, as technological advancements in electrical generation increased the overall efficiency and reliability of power plants, maintenance costs of these generation facilities dropped. This made it so that the electrical utility grid itself was the main reason for power failures and energy price increases, not the power generation facilities (especially for individuals living in remote locations). Today the only way to truly increase efficiency within the electrical utility grid system, is to upgrade the grid itself. However, the sheer scale and size of the national utility grid would make renovation costs extremely high (Momoh & Meliopoulos, 2012).

Distributed generation systems allow for a more customized approach to meeting energy needs. From a market standpoint, smaller energy generation facilities (microgrids) are becoming more and more valuable due to their design flexibility, resiliency, financial stability, and environmental sustainability. Microgrids operate on a fixed cost basis. Once the initial startup investment is made, maintenance and upkeep costs are the only significant financial constraints for a microgrid system. Whereas,

reliance on a centralized energy source leaves one vulnerable to the volatility of energy costs (Introduction to distributed generation”).

Microgrid technology provides the opportunity to escape all of the technical and financial burdens of relying on a centralized energy source. Using distributed generation and a systems approach, a resilient, efficient, and financially viable microgrid can be successfully integrated into an existing facility or community. Not only do microgrids increase energy security from emergency scenarios, but they also allow for a facility or community to run on a fixed cost. The fluctuation of energy prices makes it nearly impossible to predict future operational costs for a given facility. With a microgrid system, energy costs remain consistent and financially predictable. Renewable energy microsources help make a microgrid system environmentally sustainable while allowing for localized energy generation. Microgrids also benefit the electrical utility grid by helping to provide some of the energy required to meet peak loads. As energy prices continue to become increasingly unstable and energy security threats become more and more of a likelihood, it is crucial to consider distributed generation technology as a way to regulate energy costs and to diversify the national and global energy portfolio. It is unreasonable and unsafe to rely on only a few main power sources for the vast majority of the energy that is needed. Using a systems approach to energy generation, diversifying energy sources, and localizing energy facilities so that energy is generated close to the location where it will be used, will allow for both individuals and electric utilities to become more resilient to energy security threats and to fluctuations in energy related costs.

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