EMBRACING UNCERTAINTY: SCENARIO PLANNING FOR CLIMATE CHANGE-SECURITY CHALLENGES AND OPPORTUNITIES

A Dissertation in

Geography

by

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ABSTRACT

The relationship between climate change and security represents a subset of the growing field of environmental security, and a new area of multidisciplinary research. Although climate change is now discussed in U.S. national security policy and doctrine, scholarly research linking climate change and security has been debated, and has not yet adequately dealt with high levels of uncertainty in the associated complex socio-environmental systems. Scenario planning represents a strategic planning methodology with roots in post World War II military planning. Since the mid-1980s, scenario planning has been employed extensively in the business community, and recently has been applied to complex socio-environmental problems. Scenario planning is well suited for studying highly uncertain problems. This dissertation seeks to understand how scenario planning can be applied to understand and plan in light of climate change-security challenges and opportunities. The dissertation examines past climate change-security scenarios, including interviews with scenario participants and practitioners. A case study examines a scenario planning exercise that employs a novel method, foresight scenario planning, to understand climate change-security issues in Vietnam. The findings suggest that foresight scenario planning provides a simple, effective method to understand and plan through uncertainty related to climate change-security problems, and can be useful for conducting multilevel scenario planning and identifying surprise. The dissertation contributes to a small body of scenario planning theory, and also assesses foresight scenario planning methods, proposing improvements for future scenario planning exercises that employ this simple but useful strategic planning tool.
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Chapter 1 - General Introduction

*The most likely future isn’t.*

-Herman Kahn, 1967

**Introduction**

The socio-political unrest in the Middle East and North Africa, triggered by a series of extraordinary events beginning in January 2011, has once again demonstrated the complex, dynamic nature of the global community. Although some experts, policy analysts, and pundits correctly predicted pieces of the upheaval referred to as the ‘Arab Spring,’ none could have foreseen precisely the way in which certain catalysts triggered key events across a range of spatial, temporal, and institutional levels. There are numerous proximate and underlying causes of the unrest. Repressive governance, communications technology, social media, a youth bulge, urban poverty, and the rapid rise in global food prices have all emerged as causes of or catalysts for popular uprisings in the Middle East and North Africa. These uprisings have resulted in regime changes in Tunisia, Egypt, Libya, and Yemen, widespread, violent civil unrest in Bahrain, civil war in Syria, significant protests and calls for reform in Morocco, Algeria, Oman, Iraq, Turkey, and Kuwait, and minor protests in other Arab states, altering the national and international security landscape of the region. At least one of the aforementioned variables—the spike in global food prices—is associated with extreme meteorological
events in the summer of 2010, including record heat and drought in Russia and severe, widespread flooding in Pakistan, and long term drought in the eastern Mediterranean region. Although these meteorological anomalies cannot be directly linked to changing climate, climate scientists predict higher frequency and intensity of such anomalies as the atmosphere warms in coming decades.

The Arab Spring provides but one example of a complex web of environmental and social variables interacting and changing over a range of temporal and spatial scales to influence local, national, and international stability and security. Given such complexity, and the associated uncertainty, how can we possibly learn the effect that environmental change, or, more specifically, climate change, may have on national or international security, and plan accordingly?

Many methods attempt to forecast, predict, or imagine the future. Most of these methods fall into the field of futures studies; simulation and computer modeling are among the most widely used. Simulation “is a process by which the structure and change of some system, organism, or set of interrelated variables is represented by another, usually manipulable, system or model designed to be similar to the original in some specified and relevant ways” (Bell 1997, 272). Most simulations today are accomplished, at least in part, with computer models. Improvements in computing over the past two decades have facilitated significant improvement in simulating complex problems. Nonetheless, simulation and modeling have significant limitations, especially in replicating complex social change and down- or up-scaling conditions. Integrated assessment models have incorporated social variables and taken more holistic, interdisciplinary approaches in simulating complex problems, with a goal of making
results more useful for decision makers. The socioeconomic scenarios developed during integrated assessments are dependent on the output of simulations, and provide important projections of the future. But integrated assessments have a number of limitations, including challenges dealing with uncertainty and high cost (Rotmans and Asselt 2003). Integrated assessment model scenarios provide important projections of the future, but are created using different (and more complex) methods than scenario planning, the focus of this dissertation.

Scenario planning—a methodology employed to understand and plan for the future in the face of significant uncertainty (van der Heijden 2005)—represents a tool that may be useful for scholars, strategic planners, decision makers, and other stakeholders. Scenario planning exercises have been employed over the past fifteen years to understand and plan through complex, highly uncertain socio-environmental problems. Although socio-environmental scenario planning has become more popular in both research and policy communities, most focus only on a single spatial, temporal, or institutional level. By focusing on a single spatial, temporal, or institutional level, these scenario analyses may overlook important emergent properties—properties that become apparent at one level that cannot be identified or predicted just by examining lower level phenomena (Walker and Salt 2006, 35). Additionally, although scenarios are well suited to deal with complex problems associated with high degrees of uncertainty, few scenario analyses have included scenarios that address surprise\(^1\) (Toth 2008, Rounsevell and Metzger 2011). Instead, most scenario planning exercises remain well within the bounds of

\(^1\) I draw on the typology of surprise outlined by Kates and Clark (1996) who discuss two broad categories of surprise events: rare events with serious consequences, and common events that either are not detected or are not prevented. Additionally, surprises may arise from unexpected or mistakenly attributed consequences. Toth (2008) considers surprise to be a special and extreme form of uncertainty.
probable events, neglecting to explore plausible but surprising events. Toth (2008) points out that surprises often come about due to personal or social limitations to perception, and that scenarios are especially well-suited for dealing with such limitations, but so far scenario planning has not been adequately employed to explore surprise:

“If scenarios are to be of any benefit to decision makers, they need to include plausible trends and events that are far beyond the current range of expectations or even imagination of the intended users” (Toth 2008, 170).

My research deals with these two critical yet neglected issues, thereby making both theoretical and methodological contributions to scenario research and to climate change-security research.

Scenario planning represents a methodology summarized by building plausible scenarios of the future, then comparing those scenarios, and, finally, evaluating consequences associated with those scenarios (Alcamo 2008b). First developed by military strategists following World War II (e.g., Kahn 1962), then adapted and refined by the business community for several decades (Kahn and Wiener 1967; Wack 1985a, 1985b; Schwartz 1996; van der Heijden 2005), scenario planning “emerged as a means of characterizing the future and its uncertainties through structured, but imaginative thinking as a process that pushes us beyond the axioms and norms that are the constraints of conventional wisdom” (Rounsevell and Metzger 2010, 606). Scenario planning has been applied to a wide range of topics, including a growing body of research on socio-environmental problems. This dissertation critically examines scenario planning in socio-environmental research and policy, focusing on a subset of socio-environmental research—the relationship between climate change and security.
Background

The relationship between climate change and security\(^2\) is complex, as described in a relatively small body of scholarly research that has recently emerged (Nordås and Gleditsch 2007; Raleigh and Urdal 2007; Hsiang et al. 2013). The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (Parry et al. 2007) briefly mentions links between climate change and conflict, but does not provide supporting research\(^3\). The final draft of the Fifth Assessment Report (AR5) includes a chapter on human security, in which one section discusses recent research on the relationship between climate change and armed conflict (Adger and Pulhin 2014). The AR5 concludes that “confident statements about the effects of future changes in climate on armed conflict are not possible given the absence of generally supported theories and evidence about causality” (17). Causal connections between climate change and conflict remain unclear, and are the subject of ongoing debate among scholars (e.g., Burke et al. 2009; Sutton et al. 2010; Burke et al. 2010; Hsiang et al. 2013). Much of the scholarly research that has focused on climate and conflict has employed methods that attempt to correlate climate change with indicators of conflict. As noted in AR5, such methods are problematic—they typically focus on a single spatial level, thereby missing or neglecting emergent properties; they are limited in the number and scope of social variables

\(^2\) The term *security* has many definitions. In this dissertation I focus mainly on *national security*, a concept not easily defined, but perhaps more easily understood by defining it in terms of threats. Levy (1995, 40) suggests “A threat to national security is a situation in which some of the nation’s most important values are drastically degraded by external action.” I provide a more detailed discussion of security in Chapter 2, expanding on the concept of national security, and addressing other important concepts, including international security, human security, and stability.

\(^3\) The final draft of the IPCC Fifth Assessment Report (AR5) includes a chapter addressing human security, including a section summarizing research on climate change and conflict; see http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap12_FGDall.pdf
included in their analysis; they normally follow linear causal relationships and fail to address non-linearity, feedback, or thresholds; and the existing research relies almost exclusively on data from past events and historic conditions, so the results may be very limited in what they can tell us about the future under conditions of unprecedented climate and social change (Adger and Pulhin 2014).

A growing body of gray literature addresses climate change, conflict, and security, including numerous white papers, studies, and other publications by government institutions, intergovernmental organizations (IGOs), and non-governmental organizations (NGOs). The U.S. Congress required the establishment of the U.S. Global Change Research Program in 1990 (Global Change Research Act of 1990), which coincided with some of the earliest research on the relationship between climate change and security (discussed in detail below). In 2008, Congress directed the Department of Defense to include discussion of the effects of climate change on U.S. national security in the next Quadrennial Defense Review (National Defense Authorization Act for Fiscal Year 2008). U.S. national strategic policy documents, including the 2010 National Security Strategy (NSS; Obama 2010), the 2010 and 2014 Quadrennial Defense Reviews (QDR; Gates 2010; Hagel 2014), and the 2010 Quadrennial Development and Diplomacy Review (QDDR; Clinton 2010), address the relationship between climate change and security. For the first time, each of these recurring strategic documents features climate change as an important factor influencing U.S. national security, but the theoretical underpinnings of climate change-security issues in the documents are unclear—the

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4 Gray literature includes white papers, reports, conference proceedings, or other literature that is not peer reviewed or commercially published.
strategic documents neither list supporting references, nor contain any theoretical background in the documents themselves. The processes used to develop the NSS, QDR, and QDDR, as well as the decision to include climate change as an important factor affecting U.S. national security, are not transparent, and the documents do not provide supporting references or research.

Within the climate change-security gray literature, two major climate change-security scenario reports have been published. The first, “An Abrupt Climate Change Scenario and Its Implications for United States National Security” (Schwartz and Randall 2003), was a single scenario developed for Pentagon planners in order to “imagine the unthinkable—to push the boundaries of current research on climate change so we may better understand the potential implications on United States national security” (Schwartz and Randall 2003, 1). The authors, who are scenario planning experts with backgrounds in scenario development for the business community, interviewed climate scientists, and incorporated expert input in developing their single scenario. The scenario examined the national security implications of abrupt climate change—patterned after the rapid (100 year) climate change that followed a collapse of the North Atlantic thermohaline circulation approximately 8,200 years ago. In the scenario, the authors assumed an average annual temperature drop of 5 to 6 degrees Fahrenheit in Asia, North America, and northern Europe, and temperature increases of 4 degrees Fahrenheit in Australia, South America, and southern Africa. The scenario also assumed persistent drought in important agricultural regions in Europe and eastern North America. The authors then examined how such climate change could create geo-political destabilization driven by food shortages, decreased access to fresh water, and disrupted access to energy supplies.
Although the results of this single scenario may have been useful for strategic planners, the specific scenario methods employed were neither transparent nor reproducible. Additionally, the results were not communicated effectively to the general public. The popular media seized on the report, depicting the results as a *forecast*, rather than as a *plausible future*, as was intended by the authors and by the Pentagon. These unintended results highlight a challenge of scenario planning, and underscore the importance of effectively communicating uncertainty in scenario development.

The second climate change-security scenario that appears in the literature was conducted in a joint effort by the Center for a New American Security (CNAS) and the Center for Strategic and International Studies (CSIS)—two Washington, D.C., based non-governmental organizations (NGOs). Organizers convened a small working group of scholars and national security experts for a scenario exercise to examine the implications of climate change for U.S. national security. The results of the exercise were published in a report, *The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change* (Campbell et al. 2007), and have been widely read and cited in the academic and policy communities. The group considered three scenarios: Expected Climate Change (assuming 1.3°C global warming over 30 years), Severe Climate Change (assuming 2.6°C global warming over 30 years), and Catastrophic Climate Change (assuming 5.6°C global warming over 100 years).

Participants relied on IPCC AR4 model assessments to provide the physical variables to

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drive their scenarios, including temperature and precipitation changes, as well as many of
the second-order physical and socio-economic impacts. The scenarios focus at the global
level, but discussion of spatial level interactions (global to regional) varies significantly
from one scenario to the next within the report. Campbell et al. (2007) represents a first
step in applying scenario methodology to U.S. climate change-security problems and
policy, but one that can be strengthened and improved.

In summary, both the research and policy communities are increasingly interested
in complex socio-environmental problems, including challenges and opportunities
associated with climate change and national security. Scenario planning represents a
methodology appropriate for understanding and planning in light of problems that are
highly complex and uncontrollable, but attempts to employ scenarios to climate change-
security research and planning have so far been limited.
Figure 1-1 Situating the Research. The research conducted for this dissertation resides at the nexus (as indicated by the arrow) of two broad, mostly exclusive areas of study.

**Problem Statement**

Although scenario planning has been used to study socio-environmental problems, it has not been employed extensively to understand complex, multilevel socio-environmental problems (Döll et al. 2008; Rounsevell and Metzger 2010; Scholes et al. 2013), or surprise (Swart et al. 2004; Toth 2008). The existing examples of multilevel scenario planning or scenarios that incorporate surprise lack internal consistency, rigor, or transparency in their methods. In Chapter 2, I provide specific examples of such scenario planning research. Climate change, conflict, and security research represents a
relatively new area of multidisciplinary study. The existing scholarly research has not sufficiently addressed issues of spatial scale or surprise, and methodologies employed in this research have not adequately dealt with high levels of uncertainty or risk in the associated complex systems (Nordås and Gleditsch 2007; Hsiang et al. 2013; Adger and Pulhin 2014). This dissertation addresses these gaps in the scenario planning and climate change-security bodies of research.

**Purpose and Significance**

**Purpose**

The research conducted for this dissertation is first and foremost a study of a methodology—scenario planning and analysis. The purpose of the research is to understand how scenario planning may be employed more effectively and rigorously to explore and plan in light of complex socio-environmental problems. In support of this general purpose, I have two research goals. First, I seek to advance a theoretical framework for environmental scenario planning that enables a better understanding of complex, multilevel socio-environmental problems. I draw from the only existing scenario theory—Scenario Planning Theory (SPT; Chermack 2005, 2011), established for scenario planning in businesses and organizations, and applicable more broadly. Second, I seek to apply a novel scenario planning method that draws on the aforementioned theoretical framework to a socio-environmental problem—a problem relating climate change and national security. Specifically, I apply a relatively new scenario planning
method to examine energy and environmental security challenges in Vietnam and Southeast Asia over a 5 to 10 year planning horizon. The dissertation answers the following questions:

- How does scenario planning deal with issues of multiple spatial levels and surprise in addressing uncertainty associated with complex socio-environmental problems, such as climate change and security?
- How can a better understanding of uncertainty, gained through scenario planning, inform research, strategic planning, and policy on problems associated with climate change and security?

**Significance**

The significance of this research is multifaceted. First, from a theoretical standpoint, it contributes to scenario planning literature by developing a framework that addresses multiple spatial levels. By discussing and then building on SPT, the research helps to satisfy calls for increased rigor and reproducibility in scenario planning, especially with qualitative scenarios and storylines. Currently, there is little in the peer-reviewed literature that addresses scenario planning theory (Chermack 2005, 2011). Yet the use of scenario planning continues to become more widespread for many reasons—scenarios can provide a relatively simple way to understand complex, highly uncertain problems; scenario planning can bring together diverse groups of stakeholders and decision makers around a common problem, fostering dialogue, improving learning, and helping to identify critical uncertainties and possible solutions. The dissertation
examines the domains of the only existing scenario planning theory, and confirms the value of scenario planning theory for scenario experts and practitioners. Finally, when published, the research will be the first peer-reviewed research employing scenario planning to understand a climate change-security problem from a U.S. perspective.

Second, from a methodological perspective, the research examines scenario planning “best practices,” both in the retrospective analysis of past climate change-security scenarios in the first research phase, and in the scenario planning exercise conducted in the second phase. This dissertation makes several methodological contributions to scenario planning. It confirms the need for the precise use of terminology among participants when planning and executing scenario exercises. This research adds to existing evidence (summarized by Chermack 2011) that scenario planning exercises can serve as important didactic vehicles for participants, and also can help bridge science-policy divisions and foment interdisciplinary cooperation when scenario exercise participants are drawn from multiple disciplines and areas of expertise in both the science and policy communities (Rounsevell and Metzger 2011). The climate change-security scenario exercise conducted in Phase II identifies areas for future research and informs strategic planning and policy. Finally, the research conducted for this dissertation confirms that scenario planning in general, and foresight scenario planning specifically, are useful for exploring future complex environmental security challenges and opportunities, including security issues related to climate change. The results of the research identify several best practices for scenario experts and practitioners. The exercise also and confirms previously identified limitations of scenario planning.
Dissertation Structure

The dissertation is organized into five chapters: an introductory chapter, a literature review chapter, two chapters presenting research methods and results, and a concluding chapter. Chapter Two presents a thorough review of several bodies of literature that make up the theoretical and applied underpinnings of the dissertation research, including the theoretical framework for the dissertation. In the literature review, I begin by defining several important terms and concepts, including *scale*, *security*, *risk*, *uncertainty*, *surprise*, and *scenario*. Then, in the first section of the literature review, I focus broadly on *futures studies*, and more narrowly on *scenario planning* and *analysis*. I explore *socio-environmental* scenario research, including the three main threads of socio-environmental scenarios: exploratory, normative, and business as usual. I review recent attempts at conducting multiple spatial level scenario planning. Finally, I set the stage for the following chapter with a critical look at the few *climate change-security* scenarios that have been conducted. In the second section of the literature review, I present an overview of *environmental security*, reviewing its background and current issues. Next I examine a subset of environmental security, looking at recent literature linking *climate change*, *conflict*, and *security*. Throughout the literature review, I highlight strengths and gaps in the existing research on both socio-environmental scenarios and climate change-security studies.

Chapter Three presents the first phase of original research conducted for the dissertation. After a brief background that situates the research, including the theoretical framework upon which the research draws, I present the research methods, findings, and
a discussion of the results. In Chapter Three, I address my first research question: How does scenario planning deal with issues of multiple spatial levels and surprise in addressing uncertainty associated with complex socio-environmental problems, such as climate change and security? Through a series of semi-structured interviews with past participants and experts in climate change-security scenarios, I critically examine scenario planning methodology as it was employed in these recent scenario exercises. I explore both the scenario building process, as well as the results of these specific scenario exercises. The chapter concludes by discussing how the results of this first phase of research inform the second phase of research, addressed in Chapter Four.

Chapter Four presents methods and findings from the scenario planning case study conducted for the dissertation research. The chapter begins with an overview of the scenario framework used for the case study, and then outlines the specific climate change-security problem addressed during the scenario exercise case study. Each stage of the scenario exercise is discussed in detail—the preparation and planning, execution, and follow-up. The results of the specific scenario exercise are presented, followed by a discussion of the scenario development process, observations, and feedback from participants.

Finally, Chapter Five summarizes the findings of my dissertation research, restates the significance of the research, including the contributions the research makes to both the research and policy communities, and recommends areas for future research.
Chapter 2 - Scenario Planning and Environmental Security: A Review of the Literature

*We can't solve problems by using the same kind of thinking we used when we created them.*

-Albert Einstein

**Introduction**

The research conducted for this dissertation resides at the nexus of two extensive, but seemingly disparate, bodies of research—scenario planning and environmental security. The first, scenario planning, represents the primary focus of the dissertation. In this chapter I review the history of scenario work, the theory that underpins scenario research and practice, recent developments in scenario practice, and examples of environmental and socio-environmental scenario planning. The second, environmental security, represents an array of complex problems that serve as a subject for the scenarios studied in this research. My review of environmental security begins with a brief overview of two decades of environmental security literature, and then focuses more narrowly on climate change-security literature, with a close look at the relationship between climate change and U.S. national security.

**Origins of Scenario Planning**

Scenario planning represents an array of methods to develop plausible futures. In simple terms, scenario planning is a strategic planning tool that incorporates uncertainty
and ambiguity inherent in many complex, long-range problems and environments. Though scenario planning is a relatively young discipline, Chermack (2011) identifies eighteen definitions of scenario planning in the literature since 1985, with an uptick in definitions since 1997 as scenario planning becomes more popular. Specific methods employed in scenario planning are quite diverse, leading to what some have called methodological chaos (Bradfield et al. 2005), but recent efforts in the academic community have worked to streamline scenario methodologies, improve the academic rigor of scenario planning and analysis, and make scenario processes more transparent (Swanson and Chermack 2013). Many definitions of scenario-related terms exist, which can easily lead to confusion; for the sake of clarity, I employ the following definitions. A scenario is “a tool for ordering one’s perceptions about alternative future environments in which one’s decision might play out” (Schwartz 1996: 4). More specifically, a scenario “is a coherent, internally consistent, and plausible description of a possible future state of the world” (Carter et al. 2007: 145). An important question to ask when developing scenarios is: “For what, or for whom, are the scenarios created?” Chermack and Lynham (2002) synthesize definitions of “scenario” based on their extensive review of scenario literature, and help to answer this question, observing four categories of outcomes from scenario planning: to change thinking, to create narratives about the future, to improve decision making, and to improve learning and creativity. The purpose for which a scenario is developed often drives what information is necessary to build the scenarios, who will be involved in the scenario planning, how the results will be assessed, and what the results will be used for. Scenarios improve understanding of a problem, facilitate learning in a group or organization, or assist with decision making related to
policy. Scenario planning theory, discussed in detail below, further develops the definition of \textit{scenario} as employed throughout this dissertation. It is important to note that although scenario planning involves building scenarios, not all scenarios are developed using scenario planning methods—the term \textit{scenario} is used by many disciplines and practices, which can lead to confusion in discussions about scenario planning. This dissertation focuses on the theory and practice of scenario planning, as defined in this section.

A scenario is different from a \textit{forecast}, which is a prediction of the future in some form. A forecast generally requires more data and greater certainty than is required for building a scenario (van der Heijden 2005). Both forecasts and scenarios may follow nonlinear pathways, but the distinction between scenario and forecast is important—scenarios do not try to predict the most likely future, only to create a plausible futures (Figure 2-1). The distinction between scenario \textit{planning} and scenario \textit{analysis} is subtle but worth noting—the terms are often used interchangeably. Scenario \textit{planning} implies developing scenarios to plan for the future—this is most common in business and government, but also applies to the academic community. A scenario planning exercise involves the development of at least one scenario, and there might be no comparison of scenarios even if more than one is developed. Scenario \textit{analysis} involves the development of more than one scenario, and the subsequent comparison of those scenarios in some way (van der Heijden 2005).
Forecasts vs. Foresight. Forecasts can follow linear or non-linear paths, but usually begin with a set of conditions and attempt to identify the most likely outcome. Scenarios begin with a set of assumptions (current realities), and can follow multiple paths to arrive at differing plausible futures (Briggs 2011).

Figure 2-2 compares a number of ways to characterize the future—scenarios represent a characterization that is plausible, but is not ascribed any likelihood, and can range from moderate to high levels of comprehensiveness.

Important to the understanding of scenario planning in the context of this definitions is a clear definition of scale. Neumann (2009) highlights the confusion and debate that has emerged in the geographic community about the very term “scale.” Throughout this dissertation, I generally follow the convention of scale described by Wilbanks and Kates (1999). Specifically, I mention three different scales (spatial, temporal, and institutional), each with a range of hierarchies I refer to as levels. Conventional spatial levels include (but are not limited to) local, national, and global. A
focus of this dissertation, as previously noted, is a need for scenario planning that includes multiple spatial levels, which I refer to in many cases as multilevel scenarios. A multiscale scenario would be a scenario that explicitly considered an institutional and temporal scale, for example, and may not necessarily be a multilevel scenario.

Scenario planning was developed by military strategists following World War II, and then adopted and refined by the business community for several decades. In the 1960s, scenario planning “emerged as a means of characterizing the future and its uncertainties through structured, but imaginative thinking as a process that pushes us beyond the axioms and norms that are the constraints of conventional wisdom” (Rounsevell and Metzger 2010, 606). One of the most well known scenario planning exercises was started in the early 1970s by the Royal Dutch Shell Corporation in order to map out plausible futures for energy markets. Shell continues periodically to develop scenarios that look forward over a forty year horizon (Shell 2011), and their original methodology has developed into one of the most widely used scenario methodologies employed by scenario practitioners today—in the business community as well as the research and policy communities (Bradfield et al. 2005).
Scenario planning methodology has evolved into several complex forms, but most scenario exercises are conducted in order to satisfy one or more of the following four objectives (Alcamo 2008b; see Figure 2.3):

- to make sense of a confusing or puzzling situation
- to develop some type of strategy
- to anticipate future events or series of events, or
- to facilitate organizational learning in some way.
The scientific community tends to focus on scenario planning and analysis that attempts to open up exploration of a problem, while the policy community focuses on scenario planning that creates or influences policy, or determines the future effects of policy decisions (or the absence of policy). Such policy-related scenarios may also be exploratory, but they often begin with a goal of developing or identifying specific policy outcomes or impacts. Recent attempts to employ scenarios to combine these two approaches in order to help bridge the science and policy communities are documented (Alcamo 2008b). Most scenarios are conducted as one-time problem solving exercises, but there are examples of on-going scenario exercises, where participants or institutions

<table>
<thead>
<tr>
<th>Opening up exploration</th>
<th>Final decisions</th>
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<td>One-time problem solving</td>
<td>On-going survival</td>
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<td><em>Making sense of a puzzling situation</em></td>
<td><em>Anticipation</em></td>
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<tr>
<td><em>Developing strategy</em></td>
<td><em>Adaptive organizational learning</em></td>
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Figure 2-3 Purposeful Scenario Work. Opening up exploration aligns with inquiry-driven scenarios, while final decisions line up with strategy-driven scenarios, after Alcamo’s (2008b) typology. Source: Schweizer (2010) and Bradfield et al. (2005).
revisit previously developed scenarios to update assumptions, revalidate storylines, and assess scenario validity—the Shell Energy Scenarios are one such example\(^6\) (Shell 2011; National Intelligence Council 2012).

Scenario planning has been criticized for several reasons. Within the academic community, there are concerns that scenario planning lacks standards common in empirical research. This includes the aforementioned challenges of “methodological chaos,” as well as a lack of objective measurements of key concepts or outcomes. Additionally, because many scenario methods have evolved within the business and intelligence communities, there is a lack of transparency surrounding methods and results (for both proprietary and security reasons; e.g., Schwartz and Randall 2003; National Intelligence Council 2008; Shell 2011). The academic community has worked to address issues of transparency (Rounsevell and Metzger 2010), but much work remains. Another challenge for (and criticism of) scenario practitioners is that there has been little in the way of post-scenario assessment (Chermack 2011)—how well did a scenario exercise identify critical uncertainties? Did organizational change or effective policy result from a scenario exercise? Did scenario participants learn as a result of the exercise? Post-scenario assessment can be extremely difficult to conduct because of long time horizons involved, especially in scenarios that look out decades in the future. Other post-scenario assessments, including those related to organizational change and learning, have been

\(^6\) Another example is the recurring Global Trends scenario planning, conducted by the U.S. intelligence community every five years in order “to stimulate strategic thinking about the future by identifying key trends, the factors that drive them, where they seem to be headed, and how they might interact” (National Intelligence Council 2008). The National Intelligence Council has conducted and published a Global Trends scenario analysis every five years since 1997, the most recent being Global Trends 2030, published in 2012.
neglected. Finally, only recently have scenario exercises been documented in the peer-reviewed literature (e.g., Wollenberg et al. 2000; Abildtrup et al. 2006; Enfors et al. 2008; Dermawan et al. 2013; Tschakert et al. 2014). Again, this is a problem that the academic community is addressing, but it will take time to build a robust, scholarly body of literature.

In summary, scenario planning methodology has evolved over the past half-century along a number of pathways—in the academic community, the business community, and in government. Before addressing some of the theoretical underpinnings (and shortcomings) of scenario planning methodology, it is important to situate scenario planning within the broader field of futures studies.

**Futures Studies**

Futures studies emerged in the second half of the last century as a relatively new field of inquiry, and is oriented on systematic thinking about possible alternative futures (Kahn 1962). It differs from traditional empirical research, which, whether qualitative or quantitative, dominates scholarly inquiry and is central to the scientific method. Empirical research has limits, especially when examining or anticipating events that have not yet happened. Additionally, most empirical research focuses at a single spatial level, often neglecting cross-level interactions (Leemans 2005). Complex, large-scale or multi-level problems, such as climate change or global change, can be particularly difficult to study using the scientific method, especially considering that future conditions affecting these problems are likely to be unprecedented. Through systematic observation,
measurement, and experimentation, the scientific method tells us much about the past and present physical and social impacts of climate change, but is often not suitable for predicting, forecasting, or planning for future climate change and its implications because it relies on historic relationships and the presumption that the future is determined by past trends. Anticipating and planning for climate change-security issues present very complex problems, the study of which is not well suited for most traditional research methods. The field of futures studies employs an array of methodologies to anticipate and plan for the future, including use of a wide range of modeling, simulations, and trend analysis (Bell 1997).

Although not as well established as most empirical research fields, futures studies methodologies evolved rapidly during the second half of the 20th Century, both in the academic and policy communities. The purposes of futures studies are “[t]o discover or invent, examine and evaluate, and propose possible, probable and preferable futures” (Bell 1997, 73). Futures studies offer a large array of methods for problem solving, many of which are drawn from other fields and aim to be practical and usable in the real world. Here I describe a handful of futures methods, highlighting some of the significant classes to give an idea of the scope of futures studies.

Basic futures studies exercises employ relatively simple methods such as time series extrapolation or survey research. Time series extrapolation relies on past, quantifiable observations to identify a trend or pattern over time, and then develop a simple mathematical model to project that trend into the future. For example, demographers employ time series extrapolation to project future human population (Bell 1997). Time series extrapolation is only useful for problems involving a small number of
variables, and works best when there is a robust data set of past observations. Survey research involves asking individuals questions about their experiences, observations, opinions, beliefs, intentions, expectations, or fears. Survey data can then be analyzed collectively to identify images of possible alternative futures for a group or population. The Delphi Method, developed by RAND researchers in the 1950s and 60s (Brown 1968), is another example of futures studies—one that combines survey research with expert opinion and feedback through a series of steps that typically culminate with a report discussing possible future scenarios. Simulation, computer modeling, and gaming are also common futures study methods. Simulation “is a process by which the structure and change of some system, organism, or set of interrelated variables is represented by another, usually manipulable, system or model designed to be similar to the original in some specified and relevant ways” (Bell 1997, 272). For futures studies, a simulation must be manipulable to project future conditions. Most futures simulations today are accomplished with computer models. Improvements in computing over the past two decades have facilitated significant improvement in simulating complex problems. Coupled ocean-atmosphere general circulation models provide an excellent example (Nihoul 1985). Nonetheless, simulation and modeling have limitations, especially in replicating complex social change and down- or up-scaling conditions. Gaming is accomplished when people act as players in a simulation. Games employ scenarios—preparation for games involves development of scenarios as background for the game, and to drive events during the game. Bell (1997) identifies eight purposes of gaming: teaching, training, testing systems, experimentation, entertainment, therapy and diagnosis, forecasting, and advocacy. A well planned and executed game can be very
effective in accomplishing any of these purposes, but there are drawbacks. As abstractions of reality, games necessarily exclude some elements of realism that may adversely influence outcomes. Also, games are often very dependent on the personalities of those who construct them and play them—sometimes games are repeated with players in different roles to identify alternative outcomes. Each of these specific methods can be employed to help develop storylines or scenarios that depict plausible future events, pathways, or situations. Such scenarios can then be examined, compared, or analyzed using a wide range of scenario planning or analysis techniques. Scenarios have become one of the most important and widely used methods within the field of futures studies (Amer et al. 2013).

Theory and Scenario Research

Theory may be defined as “a coherent description, explanation, and representation of observed or experienced phenomena” (Gioia and Pitre 1990). Although theory is often neglected or discounted in applied disciplines or practices, Swanson and Chermack (2013) make a strong argument for the importance of theory and theory building in applied disciplines. This section identifies the theoretical roots of scenario planning, and presents the only existing scenario planning theory. Although few connections have been made explicitly in the existing scholarly literature, there are theoretical paradigms that contribute to scenario research, including general systems theory, complexity theory, and, quite recently, scenario planning theory (Chermack 2011).
General Systems Theory

General systems theory (GST) emerged in the middle of the 20th Century. Ludwig von Bertalanffy (1950) identified common properties in systems across a range of disciplines. His pioneering ideas laid the groundwork for many important future theories, some discussed below. Scenario planning relates to GST on two levels. First, upon examining a range of scenario planning methods, one finds system characteristics in the scenario building and analysis process itself—in most cases, scenarios incorporate some type of input information, followed by either a qualitative or quantitative manipulation of that information, and a resultant scenario or set of scenarios as output. That output can be used to feed back to iterate the scenario, or into another decision or action ‘system.’ Second, scenario planning is employed to understand a wide range of systems across many sectors and disciplines. Concepts first described by GST are used by scenario participants to understand systems that are the subject of their scenario planning—these include economic, political, military, or environmental systems. General systems theory gave rise to other important concepts and theories, including complexity science, which also informs scenario methods.

Complexity Science

Complexity science emerged out of GST in the late 1960s from the Santa Fe Institute (Waldrop 1992). Complexity science focuses on the study of complex adaptive systems (CAS):
“A complex (adaptive) system can be simply described as a system comprised of a large number of entities that display a high level of interactivity. The nature of this interactivity is mostly nonlinear, containing manifest feedback loops. [...] Nonlinear interconnectivity also places fundamental limitations on our ability to validate models of complex systems” (Richardson et al. 2001, 7).

I have not found explicit connections between complexity and the concurrent early development of scenario planning, but it is easy to identify plausible connections. Complexity science and early scenario methods were co-evolving in the U.S. scientific community during the late 1960s and early 1970s. Concepts that have developed from complexity science that are especially relevant to scenario planning include ideas of emergent properties and non-linearity (Holland 1992). Complexity theory deals extensively with specification of uncertainty, and it is in dealing with uncertain futures that scenario planning is most suitable (Carter et al. 2007). Computer modeling of complex adaptive systems has been employed in recent scenario exercises, most notably the IPCC’s Special Report on Emissions Scenarios (SRES; Nakicenovic and Swart 2000). Surprise represents a special form of uncertainty. Surprise can mean a rare event with serious consequences, or a common event that is not detected or prevented. Additionally, surprises may arise from unexpected or mistakenly attributed consequences. Surprises often arise due to emergent properties or non-linearities that can result in unexpected critical transitions (Kates and Clark 1996; Scheffer et al. 2009). Not only has scenario planning emerged as a method well-suited for identifying, dealing with, or planning for non-linearities, but scenario practitioners and participants benefit from an understanding of complexity concepts that have evolved over the past four decades.
Chermack’s Theory of Scenario Planning

More recently, Chermack (2005, 2011) provides the only explicit discussion of theoretical underpinnings for scenario planning. Chermack (2011) makes a sound argument for the importance of theory for the practice of scenario planning:

“There are valuable insights to be gained from relevant theory domains that aid in understanding the practice of scenario planning. Scenario planning has grown as a practitioner’s art and has received little academic attention. A responsible analysis of any phenomenon should cover the theoretical basis that makes the logic clear for understanding why practitioners take the action that they do. This can work in reverse as well: insights gained from practicing a phenomenon can lead to a great depth of knowledge. To date, the majority of what is understood about scenario planning is based on knowledge gleaned from years of practice” (30).

Although Chermack’s focus is on scenario planning in the business community and on improving organizational performance, his concepts apply outside of business.

Chermack identifies six major theory domains that inform scenario planning: (1) dialogue, conversation quality and engagement; (2) learning; (3) decision making; (4) mental models; (5) leadership support; and (6) organization performance and change.

First, dialogue, conversation quality and engagement theory inform scenario planning by explaining communication (among participants or stakeholders) and sharing understandings of scenario environments. Van der Heijden (1997) refers to scenario planning as a “strategic conversation,” consisting of both formal and informal communication among stakeholders or participants about future scenarios.

Second, a major objective of nearly all scenario planning is learning—learning by individuals involved in scenario planning, as well as organizational learning. Chermack
(2011) identifies three relevant meta-theories of learning that he argues apply to scenario planning: social learning (learning that takes place within a social setting, such as a scenario planning group), cognitive learning (individual learning taking place by reasoning and perception, developed extensively by the field of cognitive psychology), and constructivist learning (individual learners construct meaning and knowledge for themselves).

Third, since decisions (related to research, policy, or organizational change) are often an outcome of scenario planning, Chermack makes a strong case for linking decision-making theory with scenario planning. He includes explanation of three barriers to effective decision-making that scenario planning can help overcome: bounded rationality (the severe limitation of a single decision maker to process all relevant information), exogenous and endogenous variables (the importance of distinguishing external and internal variables in a particular system or scenario—related to systems theory), and stickiness (the difficulty of knowledge transfer between or among people). For each of these barriers, Chermack explains their relation to scenarios, and how scenarios can help overcome such barriers.

Fourth, he draws on mental model theory (from cognitive psychology). He invokes a definition of mental model from Doyle and Ford (1999, 414): “A relatively enduring and accessible, but limited, internal conceptual representation of an external system (historical, existing or projected) whose structure is analogous to the perceived structure of that system.” A metaphor of a mental model is a cognitive map, and Chermack argues that scenarios “work to continuously adjust the maps, based on new understandings of the terrain. New understandings of the terrain come from rigorous
research and constant “strategic conversations” with other “explorers” of the terrain” (Chermack 2011, 52).

Chermack’s fifth and sixth areas of theory that he draws upon are leadership theory and organization performance and change theory, respectively. These two areas relate specifically to scenarios conducted within businesses or other fixed organizations, not necessarily to scenarios broadly, so I will not expound on these two areas. I will return to the first four theory domains in Chapter 3, when I assess the efficacy of past climate-security scenarios, and again in Chapter 4, in assessing the environmental security scenario case study conducted for my own research.

Drawing on theory building processes (Dubin 1978), Chermack discusses the interrelationship of these six theory domains in his scenario planning theory (SPT; Figure 2-4), which he claims helps to explain scenario planning and how it functions in different ways. First, he claims SPT offers “a thinking tool for conceptualizing how scenario projects might be facilitated,” including “items that scenario planning is designed to change” that lead to changes in “how participants view the internal and external environments [of an organization]” (58). Second, Chermack claims “the components of the theory provide convenient measurement points for assessing and evaluating the outcomes of scenario planning” (59). This is an important contribution to scenario planning literature, connecting theory with practice. Chermack correctly highlights a significant gap in the scenario literature—an absence of methods for assessing scenario planning outcomes:

“The lack of effort invested to understand the outcomes of scenario projects is a serious shortcoming. The dearth of evidence demonstrating that scenario planning is an effective investment makes it difficult to argue
for the proposed benefits...To establish the true contribution of scenario planning, projects must be assessed to build a suite of evidence supporting scenario planning and its utility” (189).

Tschakert et al. (2014) offer a method for assessing drivers of change in participatory scenario building by stakeholders.

Finally, Chermack proposes that his SPT “provides a way of categorizing new knowledge that is generated about scenario planning” (59). This final point is also a relevant contribution, but may be limited to the specific type of scenario planning Chermack is addressing, and not other applications of scenario planning outside business and organizational change arena.

![Figure 2-4 Scenario Planning Theory (Chermack 2011).](image)

Because scenario planning is appropriate in highly uncertain, uncontrollable situations, both the research and policy communities have, in the past decade, employed scenario
planning to study environmental and socio-environmental systems and problems, and to conduct planning in light of these problems. The following section discusses environmental and socio-environmental scenario planning, and highlights why this developing area of scenario planning and analysis is useful in understanding and planning for complex climate change-security problems.

**Socio-Environmental Scenario Planning**

Scenario planning has been applied to a wide range of topics and problems by scholars and policymakers, including a growing list of complex environmental problems (Biggs et al. 2007; Kok et al. 2006b, 2006a; Peterson et al. 2003; Wollenberg et al. 2000, Berkhout et al. 2014; Nakicenovic et al. 2014; Kriegler et al. 2012). Like other areas of research that have employed scenarios, environmental scenario planning has developed two distinct threads: an inquiry-driven thread that caters to the scientific community, and a strategy-driven thread that caters to the policy community (Alcamo 2008c).

Inquiry-driven scenarios attempt to make sense of complex or puzzling situations, anticipate future events or pathways, and may help to guide research. Such scenarios are more commonly constructed within the research community, are usually quantitative, and sometimes employ computer models.

Strategy-driven scenarios attempt to develop strategy or facilitate learning. Typically, strategy-driven scenarios are developed qualitatively by groups of experts, planners, or stakeholders, with a goal of facilitating planning, creative thinking about the future, or organizational learning. In the past, strategy-driven scenarios have been
criticized by the scientific community for their lack of rigor, transparency, and reproducibility. More recently, several strategy-driven environmental scenario analyses have been conducted by scholars, who have been more methodical and transparent with their methods than has been the case with strategy-driven scenario analyses conducted in the business or policy communities. Additionally, recent attempts have been made to combine the inquiry and strategy-driven threads (Wilkinson and Eidinow 2008).

The past decade has witnessed a growing body of socio-environmental scenarios emerging from the academic and policy communities. The most comprehensive example of environmental scenario planning is the Special Report on Emissions Scenarios (SRES) of the Intergovernmental Panel for Climate Change (IPCC). The most recent SRES scenarios, published in 2000, center on a suite of four overarching narrative storylines, each based on different plausible future demographic, socio-economic, environmental, and technological developments, all of which drive or affect future greenhouse gas and sulfur emissions (and therefore affect global average temperature). They exclude “surprise” or “disaster” scenarios. Each of the four storylines is used as input to drive several model scenarios, resulting in a total of 40 scenarios generated by six modeling teams, each looking out to the year 2100 (Nakicenovic and Swart 2000). In the effort to quantify and model the scenarios resulted in significant drift from the original storylines. The IPCC is employing a new scenario framework for climate change research, relying on the scientific community to develop four Representative Concentration Pathways (RCPs) and the emissions that would produce those concentrations using integrated assessment models. In conjunction with the RCPs, the integrated assessment modeling community has worked to develop a set of Shared Socioeconomic Pathways (SSPs),
which include scenario narratives that address socioeconomic and demographic information as the scenarios evolve over the 21st Century (Ebi et al. 2013). Another example of a broadly focused scenario exercise is the Millennium Ecosystem Assessment (MA; Millennium Ecosystem Assessment 2005). The IPCC and MA scenarios are wide-ranging exercises, combining qualitative and quantitative methods, involving hundreds of individuals, and requiring considerable time and resources to complete. Both have storylines as part of the scenarios. The U.S. National Climate Assessments also employed an array of scenarios to help understand the possible effects of global climate change on the U.S. (National Assessment Synthesis Team 2001; Karl et al. 2009).

In an effort to bridge science and policy to better understand and plan for complex energy and environmental security challenges, the U.S. Department of Energy established a strategic foresight network, the Global Energy and Environment Strategic Ecosystem (Global EESE), intended to be a standing, interdisciplinary network that would complement more traditional national security and intelligence organizations (Bray et al. 2009). More narrowly focused scenarios have been employed to understand water use (Mahmoud et al. 2009), agricultural land use (Abildtrup et al. 2006), desertification in the Northern Mediterranean (Kok et al. 2006b, 2006a), management of community forests (Wollenberg et al. 2000), dryland development (Enfors et al. 2008), environmental impact assessments (Berkhout et al. 2002). Scenarios have been used to understand local impacts and adaptation to climate change (Dietrich 2013; Tschakert et al. 2014).

Although most of these examples have been labeled “environmental” scenario planning, all of them include social variables, and several were conducted in order to inform policy or management decisions. It is appropriate, therefore, to discuss how
“socio-environmental” scenarios inform climate change-security research and policy.

Examining the scientific and policy responses to the MA, Carpenter et al. (2009) note the role of scenarios in future research and policy planning:

“Many of the environmental challenges that we face are unprecedented in human history, so we lack relevant data for prediction. In such cases it is important to expand the scope of questions being asked, in the hope that important possibilities are not overlooked. For this purpose, the MA used scenarios at global and local [spatial] scales. Use of scenario methods should be expanded, and tools for coupling scenarios with quantitative models should be improved. Scenarios also provide a tool for communicating uncertainties and complexity among diverse groups of experts and stakeholders” (Carpenter 2009,1308).

Scenarios are not only useful for understanding complex, unprecedented problems; they are also useful for communicating uncertainty across disciplinary boundaries and among stakeholders. Uncertainty associated with climate change and its physical and social impacts, together with the inherent uncertainty associated with national security, can combine to create highly uncertain futures when attempting to understand and plan for climate change adaptation as it relates to security. Polasky et al. (2011) identified scenario planning as an approach that can facilitate decision making by policy makers or stakeholders facing problems with high uncertainty. How can scenario planning help us understand such complex, highly uncertain problems, or facilitate planning in light of such problems? Alcamo (2008a, 4–5) identifies nine ways that environmental scenario planning can inform research and policy. Each of these translates directly to ways that socio-environmental scenario planning can inform research and policy related to climate change and national security. Alcamo (ibid, 2008a) states that scenarios can:
1. “Provide an interdisciplinary framework for analyzing complex environmental problems and envisioning solutions to these problems”

2. Provide a picture of future states in the absence of new or changed policy

3. Illustrate how policy may or may not achieve targets

4. “Identify the robustness of a particular environmental policy under different future conditions”

5. Help communicate complex information about the future of a problem

6. Raise awareness about a new or intensifying problem

7. Raise awareness about connections between different problems

8. Help policymakers, stakeholders, and others “think big” about an issue

9. Facilitate stakeholder involvement in policy development

In summary, socio-environmental scenario planning and analysis provides a way to understand and analyze complex problems, identify possible solutions, and communicate those problems and solutions to stakeholders and decisionmakers. Research conducted for this dissertation confirms several of these contributions that socio-environmental scenario planning offers, including improved understanding of complex problems by an array of stakeholders, identification of possible solutions, and ways to communicate problems and solutions to a wide audience, including decisionmakers.

**Multilevel and Surprise Scenarios**

In order to adequately and thoroughly understand complex problems, socio-environmental scenarios should capture or incorporate multiple spatial levels and
surprises (Biggs et al. 2007; Toth 2008). Very few complex socio-environmental problems involve variables or feedbacks that reside at a single spatial level. By comparison, a single-level climate model can provide important insights and information into some aspect of the climate system, but a multi-level model provides greater insight into the climate system, and may identify connections or interactions between spatial levels that would be missed by looking at only a single level. Likewise, a scenario that focuses on only one spatial level may miss important interactions or feedbacks among different spatial levels that only a multilevel scenario can identify (Döll et al. 2008).

Similarly, since scenarios are used to understand complex problems and systems involving high levels of uncertainty, often in the context of research or policy, it is very important that scenarios can be set up to help identify surprise. Unfortunately, multilevel and surprise scenarios have been largely neglected in recent socio-environmental scenario analyses (Toth 2008). Few scenario exercises formally consider multiple institutional or spatial levels (Kok et al. 2006b; Biggs et al. 2007; Frittaion et al. 2010; Rosentrater 2010; Scholes et al. 2013; Sheppard et al. 2011; Larsen and Gunnarsson-Östling 2009), but consideration of multiple spatial levels strengthens scenario planning and analysis (Döll et al. 2008). Formally coupling or nesting spatial level interactions in scenarios can be very resource intensive, but loosely or informally coupling spatial level interactions can be accomplished more easily, and may add credibility to a scenario planning or analysis exercise (Biggs et al. 2007). Multilevel scenarios are especially important to consider for understanding climate change-security problems. By loosely coupling or nesting local level and state level scenarios, for example, the scenario analyses conducted at different levels can inform each other, making the overall scenario process more robust.
Additionally, multilevel scenarios can serve to improve learning and foster communication across institutional levels. Finally, multilevel scenarios tend to improve participation, reaching beyond experts, decision makers, or other elites to incorporate a wider range of stakeholder perspectives in the research or planning process.

In addition to a dearth of multilevel scenario analyses, there have been very few scenario planning exercises that have effectively incorporated surprise (Toth 2008). Many definitions and typologies of surprise exist—for clarity I draw on the typology of surprise outlined by Kates and Clark (1996), who discuss two broad categories of surprise events: rare events with serious consequences, and common events that either are not detected or are not prevented. Additionally, surprises may arise from unexpected or mistakenly attributed consequences. On the one hand, the lack of surprise scenarios in scholarly literature may seem strange, given that scenarios are not intended to serve as predictions or forecasts of probable futures, but can be employed to explore any plausible future. On the other hand, a significant challenge in constructing a surprise scenario is getting experts or stakeholders to suspend disbelief and focus on low probability, potentially high impact events (Frittaion et al. 2010). Many scenario exercises rely on the most recent IPCC assessment for baseline data, which may be at best conservative, ignoring more recent research, or mismatched for the spatial level of study, especially for finer spatial levels (Briggs 2010). And, as previously noted, the SRES scenarios intentionally do not include “surprise” scenarios or storylines (Nakicenovic and Swart 2000; Nakicenovic et al. 2014).

There are several techniques that can help identify and incorporate surprises into scenario planning. For example, cross impact analysis offers one method of identifying
internally consistent, low probability, but plausible “surprise” scenarios for analysis (Toth 2008). Integrating environmental risk assessment into scenario planning may also help scenario practitioners and participants identify and incorporate “black swan” events into scenario exercises (Briggs 2010). A challenge in constructing surprise scenarios is effectively communicating the results of the analysis (Mahmoud et al. 2009)—if not effectively communicated, surprise scenarios can discredit the scenario process in the eyes of scenario users, including policy makers or stakeholders, who might not understand the purpose of scenarios, or that scenarios differ from forecasts or predictions. Multilevel and surprise scenarios are especially well-suited for exploring possible futures in problems related to climate change and national security.

**Climate Change-Security Scenarios**

To date, there have been two published scenario exercises that have focused specifically on the relationship between climate change and U.S. national security. The first, “An Abrupt Climate Change Scenario and Its Implications for United States National Security” (Schwartz and Randall 2003), presented a single scenario. The second, “The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change” (Campbell et al. 2007), presented three scenarios. A brief summary of each of these scenario exercises follows, with a more detailed discussion and analysis in Chapter 3. In addition to these two scenario exercises, other more broadly focused scenarios and strategic games have incorporated or considered climate change as a security issue.
Commissioned by the U.S. Department of Defense to examine potential U.S. security implications of abrupt climate change, Schwartz and Randall (2003) developed a single scenario in order to “imagine the unthinkable—to push the boundaries of current research on climate change so we may better understand the potential implications on United States national security” (Schwartz and Randall 2003, 1). The authors (scenario experts with backgrounds in scenario development for the business community) interviewed climate scientists, and incorporated expert input in developing their single scenario. Although the results of this single scenario may have been useful for strategic planners, the results were not communicated effectively to the general public. The popular media seized on the report, not as a plausible future, but as a forecast, with negative, unintended results, highlighting the challenge and importance of effectively communicating uncertainty in scenario development.

In 2007, a joint effort by the Center for a New American Security (CNAS) and the Center for Strategic and International Studies (CSIS)—two Washington, D.C., based security think-tanks—convened a working group of scholars and national security experts for a scenario exercise to examine the implications of climate change for U.S. national security. The results were published in a report, The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change (Campbell et al. 2007), and have been widely read and cited in the academic and policy communities. The report was also updated and republished as a book (Campbell 2008). The group considered three scenarios differentiated primarily by global average temperature change: Expected Climate Change (1.3°C warming), Severe Climate Change (2.6°C warming), and Catastrophic Climate Change (5.6°C warming). Participants relied on IPCC AR4
model assessments for their scenario drivers and many of the impacts. The study examines a 30 year path for the Expected and Severe scenarios, and a 100 year path for the Catastrophic scenario. The results include global and some aggregated continental or hemispheric impacts, with the spatial levels loosely coupled. Additionally, the report discusses impacts across some sectors and systems (such as energy and health), although neither the regional nor systemic analysis is consistent across the three scenarios. The scenarios all focus primarily at the global spatial level, but discussion of spatial level interactions (global to regional) varies significantly from one scenario to the next. The three scenarios, each with different authors, are presented in different styles, making comparison more challenging. Both of these climate change-security scenario exercises will be examined further in Chapter 3.

**Summary of Scenario Planning and Analysis**

In summary, scenario planning and analysis has evolved as a subset of future studies over the past four decades. Much of the methodological development has taken place in the business community, which has led to a lack of transparency and to lack of convergence on methodological consistency. This, in turn, has caused the academic community to develop its own methods. The academic community (and to a lesser extent the policy community), especially those interested in complex, uncontrollable socio-environmental problems, has turned to scenario methods over the past decade to help understand and communicate risk uncertainty, and plan future research. Concerns remain about the rigor and transparency of scenario methods, and very little has been published
about the theoretical underpinnings of scenario planning (Chermack 2011). Although environmental security or climate change-security problems seem especially well-suited for scenario exercises, only a handful of such exercises have been conducted and published (Schwartz and Randall 2003; Campbell et al. 2007).

**Climate Change and Security**

Although the relationship between the environment and security has captured the attention of strategic thinkers for millennia (e.g., Tzu 1971), the contemporary academic and policy literature on *environmental security* spans only the past few decades. Links between climate change and security represent an important, more recent subset of the environmental security literature; before focusing on this more recent area of research and policy, it is important to provide background. In this section, I begin by defining key terms important to any discussion of environment and security. Next, I review the environmental security literature, noting the four phases of environmental security research that span the past two decades. Finally, I focus attention on an important subset of environmental security—the recent, increasing interest in the relationship between climate change and conflict, as well as climate change and security more broadly.

**Environmental Security: Key Terms**

Both “environment” and “security” can take on a wide range of meanings. The first official use of the term *environmental security* appeared in a publication by the
Brundtland Commission, *Our Common Future* (WCED 1987), but the term was not clearly defined. For the sake of this research, I adopt simple, practical definitions first proposed by Levy (1995). The term *environment* is used “for issues involving biological or physical systems characterized either by significant ecological feedbacks or by their importance to the sustenance of human life” (39). Security, used in the context of environmental security, relates primarily to *national* security, and is best defined in terms of threat, or something that might disrupt security—Levy proposes: “A threat to national security is a situation in which some of the nation’s most important values are drastically degraded by external action” (40). Such external action is not limited to foreign military force, as was often the case in more traditional security studies prior to and during the Cold War. Levy concedes that such a definition of security will no doubt have “blurry edges,” and what constitutes “important values,” as well as “drastic degradation,” will continue to be contested themes in security studies. Although the state remains the primary level of analysis for most security studies, it is important to consider security above and below the national level, especially in environmental security studies. Barnett (2009) adds depth to Levy’s definition, arguing that in order to understand environmental security, one must first understand what is meant by environmental *insecurity*, which he defines as “the vulnerability of individuals and groups to critical adverse effects caused directly or indirectly by environmental change.” Barnett (2009) then defines environmental security as “the ability of individuals and groups to avoid or adapt to environmental change without critical adverse effects,” where critical adverse effects mean “changes to which individuals and groups cannot adapt so that their livelihoods are substantially negatively affected” (939). While Levy’s definition focuses primarily at the
state level, fitting better within the spatial focus of traditional security studies, Barnett’s
definition broadens the scope of environmental security beyond the state level,
incorporating a spatial level as fine as the individual. Floyd (2010), on the other hand
focuses on the state level, critically examining U.S. environmental security policy
through the lens of securitization theory. Much of the ongoing debate surrounding
environmental security results from the lack of a widely accepted definition of
environmental security, including the appropriate spatial level of focus (Briggs 2010).
This tension between the appropriate spatial level of focus (state vs. individual) will be
discussed in more detail in the next section; in this area of cross- and multi-level
dynamics, geographers have much to offer environmental security research. Barnett’s
definition of environmental security leads us to another term important to note before
proceeding—human security.

Human security has emerged as a concept closely related to environmental
security, and deserves brief attention here. The concept of human security was defined in
1994 by the U.N. Development Program (UNDP 1994). Arguing that, for too long, a
narrow definition of security had focused at the nation-state level, ignoring or
diminishing security for individuals, the report defines human security as “first, safety
from such chronic threats as hunger, disease and repression. And second, it means
protection from sudden and hurtful disruptions in the patterns of daily life—whether in
homes, in jobs, or in communities. Such threats can exist at all levels of national income
and development” (UNDP 1994, 23). While this definition is valid, in many ways it has
proven too broad to help prioritize effective human security policy, or to focus academic
research. However, the report did, for the first time, make an explicit link between
human security and the environment, and continues to influence the development community, as well as later phases of the environmental security research (Dalby 2009), which are discussed below. The AR5 dedicates a chapter to human security, conceding that definitions of human security vary across disciplines, but positing the following definition in the context of climate change: “a condition that exists when the vital core of human lives is protected, and when people have the freedom and capacity to live with dignity” (Adger and Pulhin 2014, 3).

Finally, a key focus of security studies has been on conflict (Briggs and Weissbecker 2011). Much of the existing environmental security research has focused on the relationship between environmental degradation, environmental change, or resource scarcity and violent or armed conflict. But more recently, as discussed below, environmental security research has broadened to focus on non-violent conflict and cooperation. It is important to note that the absence of conflict does not necessarily equate to security. Conflict, especially violent conflict, is more easily quantifiable than an absence of conflict. Similarly, security tends to be more subjective and difficult to quantify. This difference has contributed to an overabundance of attempts to link environmental change, especially climate change, and violent conflict, particularly in the political science community, whose methods favor very narrowly focused regression analysis that attempts to establish causal relationships among dependent and independent variables (Adger and Pulhin 2014). I argue that the difficulty in defining security has contributed, in part, to a relative dearth of rigorous scholarly research on climate change-security issues, and an over emphasis on climate change-conflict (especially violent conflict) research.
Environmental Security

For the past twenty five years, environmental security research has evolved in many directions. Topics under the umbrella of environmental security have included: natural resource scarcity and violence linkages; natural resource abundance and violence; resource scarcity and cooperation; environmental degradation resulting from war or conflict; and issues relating to human security. Environmental security has found a place in popular literature and media (e.g., Kaplan 1994; Friedman 2008; Diamond 2011; Paskal 2010), scientific research, and policy at many levels of governance. In this section, I review the evolution of environmental security through its first three phases, as delineated by Dalby et al. (2009), discuss the current (fourth) phase of environmental security research (Spring et al. 2009), and then transition to focus on recent climate change-conflict-security research and policy. Paralleling much of the environmental security debate is a growing body of critical environmental security studies (e.g., Peluso and Watts 2001; Detraz and Betsill 2009), which will not be discussed here.

The Four Phases of Environmental Security Research

An overview of the environmental security literature reveals four general phases of research. These phases provide a useful framework for reviewing the evolution of environmental security research (Table 2-1). The first phase emerged during the final years of the Cold War in the late 1970s and 1980s. A handful of scholars made a case for including the environment as a component of national security in the United States (Dalby et al. 2009). The Brundtland Report is often cited as the genesis of environmental
security concepts (WCED 1987). This broadening or redefining of traditional security studies, beyond strict defense or military concerns, represents the first attempt to establish links between environmental change or degradation and security. While the concept of environmental security expanded the traditional Cold War era definitions of security, the state remained the primary actor to be secured.

By the early 1990s, the second phase of environmental security research saw both the introduction of theory and an increase in quantitative research and case studies. The most well known and widely cited research was published by the ‘Toronto Group’ (Homer-Dixon 1994), who attempted to identify more rigorous empirical, causal connections between environmental degradation and conflict, especially violent conflict. At the same time, Kaplan (1994) presented a similar (and even less nuanced) message in the popular media about the likely rapid unraveling of security in Africa (and eventually the rest of the developing world) as a result of population increase and competition over scarce resources. Kaplan’s essay was widely read and cited in the policy community, including the State Department and The White House (Matthew and McDonald 2009). As in the first phase, the state remained the primary level of focus, and most of the research was based on ‘realist’ theories of political science thinking. Much of the Toronto Group’s research has since been criticized for overstating direct, causal connections between scarcity and violence, ignoring or downplaying other more complex paths or linkages between environment and security, diminishing the role of governance in conflict, and focusing almost entirely on environment-security connections in the

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7 The ‘Toronto Group’ is the name of a group of over 100 scholars, mostly from North American institutions, conducting environmental security related research. The group was spearheaded by Thomas Homer-Dixon at the University of Toronto, with research occurring between 1989 and 1998.
global South (Briggs 2010). Also during this second phase, Deudney (1990) provided the most frequently cited argument against linking environmental degradation and national security, offering three claims:

“First, it is analytically misleading to think of environmental degradation as a national security threat, because the traditional focus of national security—interstate violence—has little in common with either environmental problems or solutions. Second, the effort to harness the emotive power of nationalism to help mobilize environmental awareness and action may prove counterproductive by undermining globalist political sensibility. And third, environmental degradation is not very likely to cause interstate wars” (Deudney 1990, 461).

Of Deudney’s three claims, only the third remained widely unchallenged through the ensuing environmental security research and discourse. The first claim has broken down as most states have broadened their definition and focus of “national security” especially in the post-Cold War (and post 9-11) era. Some scholars, especially those from a critical perspective, continue to uphold Deudney’s second claim, but there is little definitive evidence to support it to date.

By the late 1990s, a surge in interest in environmental security by intergovernmental organizations (IGOs), NGOs, and national governments led to a third phase of environmental security research. This third phase broadened the scope of environmental security research beyond resource scarcity and violence. It included a series of government sponsored studies on the complex relationship between environmental change and security (IHDP 1999; Schubert et al. 2008), and environmental security opportunities for cooperation and peacemaking (Conca and Dabelko 2002; Priscoli and Wolf 2009). Methodologies continued to evolve as disciplines other than political science became more involved in environmental security research (including
geography, anthropology, water resources/hydrology, and sustainability). There was growing consensus that environmental scarcity alone was unlikely to lead to interstate conflict, and although many researchers continued to acknowledge the importance of national security, others began to explore the impact of global change (including climate change) on local security, including human security, and the possible emergent effect local insecurity or instability may have on national or regional security. During this third phase of environmental security research, growing interest within the U.S. government, especially the security community, had several consequences. The intelligence community explored the security implications of environmental change, including climate change (National Intelligence Council 2008; Blair 2009; National Intelligence Council 2012); the Department of Defense incorporated environmental security concepts in its key strategy documents (Gates 2008, 2010; Hagel 2014), and funded environmental security research; environmental security issues were, for the first time, integrated in the President’s National Security Strategy (Obama 2010); and Congress held hearings on related environmental security issues (Blair 2009; Burke et al. 2009b), and incorporated climate change into legislation (National Defense Authorization Act 2008). Although the U.S. intelligence community, the Department of Defense, and the Department of State have all addressed environmental security issues and concerns, no U.S. government agency offers a concise definition of environmental security.
<table>
<thead>
<tr>
<th>Phase</th>
<th>Main Attributes</th>
<th>Key Contributions</th>
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<tr>
<td>First</td>
<td>• broadening of traditional security studies, to include environmental factors</td>
<td>• Brundtland Report (WCED 1987)</td>
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<td></td>
<td>• possible links between environmental change/degradation and security</td>
<td>• Mathews (1989)</td>
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<td></td>
<td>• focused at state level</td>
<td>• Myers (1989)</td>
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<tr>
<td>First</td>
<td>• first rigorous scholarly ES research</td>
<td>• Toronto Group</td>
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<td>Second</td>
<td>• attempts to establish theory and empirical links between resource scarcity</td>
<td>• Homer-Dixon (1994)</td>
</tr>
<tr>
<td></td>
<td>and violence (case studies)</td>
<td>• Kaplan (1994)</td>
</tr>
<tr>
<td>Third</td>
<td>• focused on Global South; focus still at state level</td>
<td>• Deudney (1990)</td>
</tr>
<tr>
<td></td>
<td>• significant expansion of ES research; more nuanced methods</td>
<td>• Levy (1995)</td>
</tr>
<tr>
<td></td>
<td>• increasing links between research and policy</td>
<td></td>
</tr>
<tr>
<td>Third</td>
<td>• greater interest, research by IGOs, NGOs, intelligence community</td>
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<tr>
<td></td>
<td>• includes study of global (climate) change on local security</td>
<td></td>
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<tr>
<td>Fourth</td>
<td>• research examines links among ES, human security, and conflict</td>
<td>• Dabelko (2008)</td>
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<tr>
<td></td>
<td>• shift away from focus solely at state level; multilevel approaches</td>
<td>• Dalby (2009)</td>
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<tr>
<td></td>
<td>• risk, peacebuilding, attempts to establish theoretical framework</td>
<td>• Spring et al (2009)</td>
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<td>• chapter on ES (human security) in IPCCs Fifth Assessment Report (2014)</td>
<td>• Floyd (2010)</td>
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<td></td>
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<td>• Smith and Vivekananda (2011)</td>
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<td>• Floyd and Matthew (2013)</td>
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Table 2-1 Four Phases of Environmental Security Research (after Dalby et al. 2009).
A number of Washington-based NGOs created sections or teams to integrate research and policy on environmental security. Many of these actions will be discussed in greater detail in the following section on climate change and security. In distilling the work of the first three phases, Matthew and McDonald (2009) identify eight environmental ‘threats’ to U.S. national security, including the following that continue to be a focus for research and/or policy: conflict (not necessarily violent) affecting U.S. interests that is caused or amplified by environmental problems, including migration; activities affecting U.S. access to environmental goods abroad; greening the military; using military and intelligence assets to support environmental (and energy) initiatives; promoting dialog abroad; and providing humanitarian assistance and disaster relief. The third phase of environmental security research has by all accounts extended the scope of environmental security research, and has seen a direct link between this expanded research and environmental security policy.

Although the third phase of environmental security research significantly expanded the research and policy agenda, Dalby et al. (2009) identify several notable gaps, including “a lack of research on hazards and disasters, […], social vulnerability, bottom up resilience as well as peace building” (790). Additionally, most of the research during the first three phases was conducted by North American or European researchers, with few contributions from scholars in the global South. The number of methods employed increased during the third phase, and included qualitative case studies, quantitative analyses of conflict to determine environmental drivers, quantitative analyses

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8 Notable examples include the Environmental Change and Security Program at the Woodrow Wilson International Center for Scholars, the Center for a New American Security (CNAS), the Center for Strategic and International Studies (CSIS), the Center for Naval Analysis (CNA), and the Center for Climate and Energy Solutions (C2ES; formerly the Pew Center on Global Climate Change).
of transboundary water agreements and disputes, and a range of simulations and games to explore problems and identify possible policy solutions. Nonetheless, “while quantitative methods may contribute to the recognition of complex linkages among structural determinants, and thus to an advance in our knowledge (by way of a heuristic function), they are nevertheless not sufficient because they exclude the complexity of the interactions between nature and humans that can be neither modeled nor predicted” (Dalby et al. 2009, 789).

Where traditional quantitative methods are insufficient, and socio-environmental problems are too complex to be modeled, more integrative, non-traditional approaches may offer solutions. “Both reactive and pro-active or anticipatory learning for launching adaptive and mitigating responses requires knowledge and an understanding of these interactions that go beyond the competence of any discipline and can probably only be achieved by inter- and multidisciplinary research teams” (Dalby et al. 2009, 790).

Scenario planning methods offer one approach for ongoing environmental security research—as highlighted in the first section of this chapter, scenario planning can help understand and plan for complex problems, where uncertainty is high, controllability is low, and solutions require interdisciplinary thinking and planning. In recent years as the research (and policy) adjust to fill these gaps in environmental security knowledge, Dalby et al. suggest we have entered a new, fourth phase of environmental security research.

Dalby et al. (2009) and Spring et al. (2009) challenge scholars conducting environmental security research to be even more comprehensive than during the previous phases:
“[I]t needs to integrate physical and human sciences in ways that do neither focus simply on states on the one hand or environmental causes as a simple variable on the other. Dynamic change is crucial for understanding both human and ecological systems and how they are coupled in contemporary security thinking which is simultaneously sensitive to the specific context in which human insecurity occurs. Ecological thinking with its focus on adaptability, resilience, and interconnection now understand security in contrast to earlier formulations assuming central control and violence as the essence of security” (Spring et al. 2009, 1294).

The purpose of ongoing and future environmental research should, therefore, analyze risk, and anticipate environmental change that could lead to instability in order to facilitate timely “preventative capacity building and policies of adaptation.” Such focus does not necessarily neglect state-level security issues; rather, it necessarily includes elements of human security, leading to a more comprehensive, multilevel approach to environmental security studies.

Recent environmental security research shows signs of more comprehensive approaches than the previous three phases, including the application of a risk framework to environmental security (Mabey et al. 2011), emphasis on human security (Smith and Vivekananda 2009; Beebe and Kaldor 2010), and peacebuilding (Dabelko 2008). Additionally, attempts have been made to shore up the theoretical underpinnings of environmental security research (Halden 2011). Finally, most of the debate surrounding environmental security during the first three phases focused on the past—discussions of the future of environmental security has been neglected. An important part of this most recent, ongoing phase of environmental security studies, in both the academic and policy communities, is a renewed focus on the relationships among climate change, conflict, and security.
Climate Change, Conflict, and Security

Related to ongoing research and debate about environmental security is the study of the connections between climate change and conflict. Once thought to be too slow-changing to serve as a security concern (with the notable exception of Levy (1995)), climate change did not enter as a driver in the environmental security debate until well into the third phase of research (the early- to mid-2000s). Barnett (2003) provides one of the first comprehensive discussions of climate change as a security issue, cautiously suggesting that framing climate change as a security issue (at least in part) may help bridge science and policy. A number of more recent studies have examined possible correlations between changes in climate and violent conflict in particular. Most of this research has grown out of the political science community, and employs traditional empirical methods (e.g., Nordás and Gleditsch 2007; Raleigh and Urdal 2007; Zhang et al. 2011; Raleigh and Kniveton 2012). Historians have expanded research in this area as well. For example, demonstrates a connection between climate change in the mid-17th Century (a period of cooling) and state failure (Parker 2008). The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (Parry et al. 2007) briefly mentions links between climate change and conflict, but does not provide supporting research. Nonetheless, causal connections between climate change and conflict remain unclear, and are the subject of ongoing debate among scholars (e.g., Burke et al. 2009; Sutton et al. 2010; Burke et al. 2010). In the end, most of the existing research attempting to link climate change with conflict does little to address the uncertainty surrounding future climate change and security, and has been generally
insufficient to meet the demands of the policy community, though recently Hsiang et al. (2013) conducted a meta-analysis of the 60 most rigorous quantitative climate change-conflict studies, and identified causal evidence linking climate change and conflict across a range of temporal and spatial levels.

A much larger body of gray literature on the topic includes white papers, studies, and other publications by a number of government institutions, IGOs, and NGOs. Additionally, recent U.S. national strategic policy documents, including the 2010 National Security Strategy (Obama 2010), the 2010 and 2014 Quadrennial Defense Review (Gates 2010; Hagel 2014), and the 2010 Quadrennial Diplomacy and Development Review (Clinton 2010) address the relationship between climate change and security, but the theoretical underpinnings of climate change-security issues in these important documents are unclear.

Some scholars have expressed concern about the “securitization” of climate change, adopting a cautionary tone during this most recent phase of research, and attempting to steer the focus of environmental security away from the more traditional state level of focus (Detraz and Betsill 2009; Floyd 2010). Dabelko (2009) cautions against this: "Dismissing climate-security links because of ambiguous evidence on climate change’s contribution to violent conflict ignores a vast array of areas where climate change’s expected direct and indirect effects, as well as actions to mitigate or adapt to climate change, constitute issues of concern to a national government and the actors charged with securing its national interests" (16).

The policy community in the U.S. remains engaged on issues related to climate change and security (although less so than before the 2008 economic downturn). Within
the executive branch, the national security community has conducted or funded a number
of studies to better understand the national security implications of climate change (e.g.,
Schwartz and Randall 2003; Campbell et al. 2007; National Intelligence Council 2008;
Defense Science Board 2011). In 2008, the Department of Defense reshaped the Minerva
Initiative to fund social science research on topics important to DoD on security and
stability. The Minerva Initiative\(^9\) identified seven priority research topics, including the
national security implications of energy and environmental stress. In 2009, the U.S.
Navy created Task Force Climate Change to coordinate research and operational
planning related to climate change impacts on maritime operations, especially in the
Arctic.

The U.S. Congress has been less engaged, although both the House and the Senate
have held hearings on the security implications of climate change (U.S. Senate 2009),
and the 2008 National Defense Authorization Act included bipartisan efforts that directed
the executive branch (and specifically the Intelligence Community and Department of
Defense) to conduct periodic assessments of climate change impacts on national security,
and adjust security policy and strategy accordingly. More recently, budget challenges
and impasses by Congress have reduced funding available for climate security research.

Several NGOs in Washington, D.C., remain engaged on climate change-security
issues, including the Center for a New American Security, CNA, the Center for Strategic
and International Studies, the Brookings Institute, the American Security Project, the

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\(^9\)In 2009 the Minerva Initiative awarded a 5-year, $7.6 million to the Strauss Center for
International Security and Law at The University of Texas, one of seven Minerva-funded, university-led
research projects, which resulted in the establishment of the Climate Change and African Political Stability
(CCAPS) program. Results of CCAPS research have been very limited; their methods follow a pattern of
well established, though narrowly focused use of an array of physical and some social variables to predict
conflict patterns in Africa that may be related to certain climate drivers. [http://minerva.dtic.mil/index.html](http://minerva.dtic.mil/index.html)
Center for Climate and Energy Solutions, and the Center for Climate and Security. The 2007 report by CNA’s Military Advisory Board (MAB; a panel of retired generals and admirals), which articulated the security implications of climate change, is considered by many to be a landmark event in the U.S. climate change conversation (Catarius et al. 2007); the MAB released an updated report in 2014, refining their findings from the 2007 report, stressing the security implications of climate change, and urging action on the part of the U.S. government (Goodman 2014). The absence of legislative action on climate change, and subsequent lack of funding for climate change-security research led to diminished think-tank activity in this area between 2007-2013, but the 2014 release of AR5, the second MAB report, and action within the executive branch has generated renewed activity among NGOs focusing on climate change-security challenges. Within the United States, the federal government has not established a uniform policy regarding climate change and security, and both the academic and policy communities continue to struggle to establish an effective research agenda (and policy based on effective research) related to climate change and security. A more detailed analysis of U.S. strategy and policy related to climate change-security will be presented in Chapter 3. Based on my review of the literature, areas that are ripe for research include a more comprehensive assessment of climate change-security implications for the Arctic, better assessment of climate change impacts (such as sea level rise and severe meteorological events) on critical infrastructure, the emergent effects of human insecurity on U.S. national security interests (including migration), and more effective methods for bridging the science-policy divide on complex issues like climate change-security.
Synthesis

This chapter has reviewed two extensive bodies of literature: scenario planning and climate change-security. Scenario planning and analysis has evolved in many directions over the past four decades. The most significant methodological contributions have been made by the business community. However, scenario planning conducted by the business community, though extensive, is usually conducted behind closed doors. Continuing employment of scenarios by business indicates their utility, but methods and results are rarely available for analysis and scrutiny, and fall far short of academic standards of transparency. Government agencies and organizations have, more recently, dabbled in scenario planning. Though government-led scenarios are usually more transparent than those conducted in the business community, they nonetheless lack scholarly rigor. The lack of transparency in scenarios created by the business and policy communities has resulted in criticism by the scientific community (and a reluctance to engage in scenario planning and analysis). Recently, however, the research community has started to create a more robust, transparent body of work. Nonetheless, significant gaps remain. The scenario literature lacks any debate on the theoretical underpinnings of scenario planning. In fact, during the course of my review of the literature, I found only one source that addressed scenario planning theory at all (Chermack 2011), and it was focused primarily on scenario planning theory as employed by business-type organizations. There are no discussions of scenario planning theory for scenarios employed to understand socio-environmental problems. In addition to lack of theoretical debate, few socio-environmental scenarios have incorporated multi-level problems. Most
socio-environmental scenarios focus at a single (typically regional or global) spatial level, ignoring or minimizing variables or drivers functioning across different levels. Finally, scenario planners have not capitalized on the potential of scenarios to examine surprise events or trends—this failure is due, in part, to the wide use of intuitive logics scenario methods, which, while simple to employ, tend to trap participants into focusing only on the interplay of two drivers in three or four potential scenarios.

The second body of literature reviewed included environmental security studies, and a subset, climate change-security research. Although environmental security studies have evolved and broadened over the past two decades, significant gaps remain. As in scenario planning, there has been very little debate on theory underpinning environmental security research, especially since disciplines other than political science have entered the field. Much of the scholarly climate change-security research to date has been narrowly focused on establishing empirical, causal connections between environmental drivers and conflict, which, while important, has done little to answer more broad questions about security. There has been some discussion in scholarly literature, but very little research exploring the possible emergent effects of human insecurity on national, regional, or international security. Finally, significant gaps remain in understanding effective methods to bridge science and policy on the complex issues of climate change and security. The research presented in the following two chapters of this dissertation sits at the nexus of scenario planning and climate change-security studies, and attempts to fill some of the research gaps identified and discussed in this chapter.
Chapter 3 - Scenario Planning and Environmental Security

*Scenarios are the most powerful vehicles for challenging our 'mental models' about the world and lifting the 'blinders' that limit our creativity and resourcefulness.*

-Peter Schwartz

**Introduction**

The review of the scenario literature clearly establishes that scenario planning is suitable for understanding plausible futures involving very complex problems. Surprisingly, there are only two published examples of scenarios that focus on the U.S. national security implications of climate change (Schwartz and Randall 2003; Campbell et al. 2007)\(^{10}\). Schwartz and Randall (2003) employed a single scenario, constructed by the two authors, to explore the national security implications of abrupt climate change looking decades into the future. While their scenario represents a landmark in thinking about the security implications of climate change, it was not a scenario planning exercise, but rather a provocation exercise, intended to get policy makers and security analysts to “imagine the unthinkable.” The scenario methodology employed to construct the scenario is not included in the published report. And although the authors allegedly consulted climate scientists, security thinkers, and other experts, it is left to the reader to speculate how the scenario was constructed. Because of the lack of transparency in the

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\(^{10}\) There are other scenarios that mention climate change as a possible driver for security issues, such as the National Intelligence Council’s Global Trends series (National Intelligence Council 2012), but the two scenarios noted above are the only two that focus exclusively on climate change as a driver for national security issues.
methods used to develop this scenario, I was not able to adequately assess it. Therefore, I focused attention on the other published scenario exercise, the *Age of Consequences*.

Campbell et al. (2007) represents a more collaborative effort of scenario development, though like Schwartz and Randall (2003), it too falls short of a true scenario planning exercise. The exercise did not follow a scenario planning methodology. Scenario narratives were created by individuals, not groups, with almost no collaboration among the lead authors during the scenario development, which took place over a several month period on the authors’ own time. Collaboration took place only periodically, as authors came together to discuss their assigned chapters every few months. Nonetheless, the *Age of Consequences* represents a significant, novel effort to bring together a diverse group of experts to examine a complex, long term problem, and develop a set of three plausible futures in an attempt to change thinking about and influence planners, analysts, scholars, and policy makers in addressing issues related to climate change and national security and foreign policy. Never before had high level policy analysts and strategic planners developed and published scenarios that directly addressed climate change-national security challenges.

This chapter represents the first phase of original research conducted for the dissertation. I present the research methods, results, and a discussion of the findings. In this chapter, I address my first research question: how does scenario planning deal with issues of multiple spatial levels and surprise in addressing uncertainty associated with complex socio-environmental problems, such as climate change and security? Through semi-structured interviews with scenario participants and scenario experts in climate change-security or environmental security scenarios, I examine scenario methods as
employed in a recent scenario exercise. I explore the scenario building process, the results of a specific scenario exercise, and the utility of scenario planning in addressing complex socio-environmental problems. The chapter concludes by discussing how the results of this first phase of research inform the second phase of research (presented in Chapter 4), and scenario planning in general, as applied to climate change or environmental security problems.

**Methods**

Data collection for this phase of research was qualitative, consisting of semi-structured, one-on-one, in-depth interviews\(^\text{11}\). The interviews were conducted with selected participants from two general groups: scenario participants and scenario experts. The first group of interviews focused on participants in The *Age of Consequences* scenario exercise (Campbell et al. 2007; Campbell 2008). The *Age of Consequences*, originally published jointly by two security think-tanks in Washington, D.C., (Center for Strategic and International Studies (CSIS) and the Center for a New American Security (CNAS)), remains one of only two climate change-security scenario exercises that have been published\(^\text{12}\). The study received significant attention in the U.S. security and foreign policy community for at least two reasons—first, the lead authors were very experienced, high level policy makers, and second, the report was the first attempt to create U.S. security related scenarios driven by plausible future climate scenarios. There were fifteen

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\(^{11}\) All research for this dissertation involving human subjects was approved by The Pennsylvania State University Institutional Review Board, IRB#35285.

\(^{12}\) Schwartz and Randall (2003) remains the only other climate security scenario that focuses on U.S. national security implications of climate change.
participants, authors, and editors of the Age of Consequences scenarios, all of whom could be considered “elites” (high level professionals with extremely limited time, serving in a position of power or influence, to whom access is limited), including a former Assistant Secretary of State for East Asian and Pacific Affairs, a former national security advisor to the Vice President of the United States, a former Director of Central Intelligence, and a former White House Chief of Staff. Access to these individuals was extremely difficult. In the end, four project participants agreed to be interviewed, including one of the project co-directors, two of the lead authors, and one of the editors—all four of these individuals made significant contributions to the scenario exercise. The insights gained in the semi-structured interviews provided sufficient information to complete my assessment of the Age of Consequences scenario project—information that is not presented in either the resultant monograph or book. The interviews also provided valuable information about scenario planning in general, and about issues related to climate change and national security.

The second group of interviews involved individuals who had extensive experience with scenario planning applied to environmental security problems. Like the first group, the population from which to draw environmental security scenario experts is very small, and access to individuals (who are also “elites”) with this unique expertise is challenging. Most individuals with experience in scenario planning and environmental security reside in the defense or intelligence communities and can be restricted from participating in unclassified research. This limited the number of scenario practitioners available to be interviewed for my research, but did not adversely affect the interviews I did conduct. For my research, I was able to conduct four in-depth interviews with
environmental security scenario experts. One individual worked in the U.S. Department of Defense as a member of the Navy’s Task Force Climate Change (TFCC), one worked at the U.S. Department of Energy, and two are affiliated with the U.S. Air Force. All have extensive experience with scenario planning, climate science, environmental change, and national security policy.

For each interview, I began with a list of similar questions, and modified the questions asked as the interview progressed. For the *Age of Consequences* participants, interviews initially focused on the specific scenario planning exercise first, and then on scenario planning and climate change-security issues more broadly (Table 3-1). Interviews conducted with the scenario experts focused on their past scenario planning experiences specifically and on environmental security scenarios in general. Rarely did I ask a participant all the questions on the initial list. Most interviews were conducted face-to-face, either at the participants’ work place, or at a neutral location that afforded sufficient privacy to conduct the interview. I obtained permission from each participant to record the interview. The interviews lasted between 90 to 120 minutes. Three participants were women, five were men. Participants ranged in age from 30 to 72 years. Two of the interviews were conducted by Skype. The interviews were conducted between October 2011 and February 2012. To protect the identity of the participants, each was assigned a code (SP-1 through SP-8, which corresponds to quotes below). All interviews were transcribed and then analyzed. To analyze the data, I carefully read the transcripts, making marginal comments and noting potentially significant themes or insights. Next, I highlighted any recurring themes that emerged from the interviews. Not surprisingly, many of the themes related to the interview questions I had asked, which
were developed from my research questions. I identified interview text and coded according to theme, and then grouped the related responses.

Results

The interviews yielded a significant amount of information about scenario planning in general, the *Age of Consequences* scenario specifically, and about climate change-national security research and policy. In the following section, I present the findings of the interviews. First, I discuss the *Age of Consequences* scenario exercise specifically—I examine how the scenarios were constructed, how the participants perceived both the process and the product, as well as challenges and limitations the participants identified. Second, I discuss scenario planning more broadly, drawing on the interviews from both the *Age of Consequences* participants and the scenario experts—here I focus on the respondents’ perceptions of how scenarios address spatial scale, uncertainty, and surprise. Third, I discuss how respondents think scenario planning is suited for understanding complex problems, and planning or testing policy and research in light of those complex problems. Finally, I address insights gained after interviewing elites.
Examples of Interview Questions for *Age of Consequences* Participants

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>How did you become involved in the <em>Age of Consequences</em> scenario project?</strong></td>
<td><strong>What organization developed the idea to conduct that scenario exercise?</strong></td>
</tr>
<tr>
<td><strong>What was your role in the preparation for the exercise?</strong></td>
<td><strong>Did you have a follow-up role once the scenarios were developed?</strong></td>
</tr>
<tr>
<td><strong>Had you ever participated in a scenario exercise before?</strong></td>
<td><strong>Did you get any sort of training or briefing or description of what a scenario exercise was?</strong></td>
</tr>
<tr>
<td><strong>Can you discuss how the scenario exercise was conducted?</strong></td>
<td><strong>As you worked through the scenario exercise were participants generally free to give input and discuss issues freely?</strong></td>
</tr>
<tr>
<td><strong>One of the challenges in developing scenarios, whether it's a climate scenario or some type of social scenario or combination of two, is maintaining internal consistency. How did you do this, or was it something you thought about when you were doing the scenarios?</strong></td>
<td><strong>Scenarios tend to be employed in problems where there are high levels of uncertainty. Did discussions of uncertainty or risk ever come up during the process of this scenario exercise?</strong></td>
</tr>
<tr>
<td><strong>Do you think the scenario process is useful in helping to understand uncertainty, especially as it relates to climate change-security issues?</strong></td>
<td><strong>The <em>Age of Consequences</em> has a global focus, although there are discussions of regional impacts. Was spatial scale ever addressed explicitly before you prepared the scenarios?</strong></td>
</tr>
<tr>
<td><strong>Did you ever explicitly talk about issues of surprise before you prepared your scenario?</strong></td>
<td><strong>Do you think that the scenario process is helpful for exploring different policy options? Explain.</strong></td>
</tr>
<tr>
<td><strong>Do you think that the scenario process is helpful in setting a research agenda? Explain.</strong></td>
<td><strong>What were the limitations or drawbacks to the way you conducted this scenario exercise?</strong></td>
</tr>
<tr>
<td><strong>Based on your experience with the <em>Age of Consequences</em> scenario exercise, do you think the process helped participants to better understand some very complex problems? Do you think there was learning that took place among the participants?</strong></td>
<td><strong>What are (currently) the three most significant challenges or obstacles to creating effective policy related to climate change and security?</strong></td>
</tr>
<tr>
<td><strong>Do you know if this particular scenario project led to any specific policy action and or change in research agenda?</strong></td>
<td><strong>Once you were done with the scenario exercise and everyone had given their input and you went to press, was there any sort of follow-up or assessment about the process?</strong></td>
</tr>
</tbody>
</table>

Table 3-1. Questions asked of scenario participants interviewed.
Developing the *Age of Consequences* Scenarios

The two published products from the *Age of Consequences* scenario exercise tell very little about the methods used to build the scenarios. Neither the monograph (Campbell et al. 2007) nor the book (Campbell 2008) discuss scenario methodology in general, or the specific methods employed by the working groups who developed the three scenarios. The following, presented in the executive summary of the monograph, is the only mention of methods:

“For the past year a group of experts, under the direction and leadership of the Center for Strategic and International Studies (CSIS) and the Center for a New American Security (CNAS), met regularly to start a new conversation to consider the potential future foreign policy and national security implications of climate change. The group consisted of nationally recognized leaders in the fields of climate science, oceanography, history, and national security….The mandate of the exercise was, on its face, very straightforward: employ the best available evidence and climate models, and imagine three future worlds that fall within the range of scientific plausibility…. For each of the three plausible scenarios, we asked a national security expert to consider the projected environmental effects of global warming and map out the possible consequences for peace and stability. Each climate scenario was carefully constructed and the three corresponding national security futures were thoroughly debated and discussed by the group” (Campbell et al., 2007, 5-6).

To be fair, the interviews reveal that the exercise was not intended to follow a specific scenario planning methodology. One of the participants stated, “The exercises were not what you typically think of as scenario planning in terms of having round tables that you present fictional information and the scenario develops that way….I think it [the method] evolved organically….I don’t think there was a real sense we needed to be by the book on methodology. This was new frontier, something you could be a bit creative about” (SP-2). Another participant stated, “In terms of methodology, I got no input, and
really I think that what we did was fairly off-the-cuff. I got no sense that anyone involved was an expert at doing scenario casting type work, although all of them I know surely had used scenarios as input to decisions” (SP-2). When asked about any limitations to the scenario approach used in *Age of Consequences*, the same participant stated, “There was not a standard set of methods that was outlined….I felt like we were losing value by not being more standard, agreeing on some standard questions….This study was not systematic methodologically. It was a lot of fun, I learned a ton. It was a prototype, and I think it’s a good prototype….but it would need to be much more systematic methodologically” (SP-1). As with nearly all scenario planning exercises (Chermack 2011), the focus of the *Age of Consequences* appears to have been almost exclusively on the *product* (the scenario narratives and resultant discussion, policy implications, etc.) with very little attention to the scenario development *process*. Among the participants I interviewed, there was some confusion or disagreement about what the scenarios were (at the time of the interview). One participant understood the scenarios to be the three climate projections which then drove the ensuing three narratives, while other participants understood the scenarios to be the resultant narrative chapters, based on the initial climate projections. Interviews reveal that none of the participants had participated in a scenario exercise exactly like this before, certainly not one that addressed the complexities of climate change and national security. In hindsight, all of the participants interviewed seemed satisfied with the results of the scenario exercise, and would not have made significant changes to the methods employed.

In the end, the participant interviews reveal that the *Age of Consequences* scenarios were developed through a non-standard scenario building process. The two
sponsoring NGOs (CSIS and CNAS) secured funding first, then invited a group of approximately ten to twelve experts, mostly senior policy and security experts and decision makers with extensive security and/or foreign policy experience, to participate in the project. Additionally, the leadership recruited one scientist who developed the three climate scenarios (based on the most recent IPCC assessment at the time) that were intended drive three security narratives or scenarios. The science advisor remained part of the working group throughout the life of the project. No scenario experts appear to have been involved with the design or execution of the project. The authors of the three scenario narratives were all very senior statesmen with extensive experience in foreign policy, national security, and intelligence. Once the authors of the three scenario narratives were identified, those authors had complete liberty to create their own narratives, though there were interim working groups to discuss the three narratives. As one author relates, “each person took off in whatever direction they thought fit, which is not the way a normal exercise scenario runs. What [we] had was a very early application of the idea, let us imagine some alternative futures, let us turn these alternative futures over to a set of extremely experienced former policy makers, and see what happens” (SP-3). At least twice, the group came back together to discuss and debate the three narratives, but ultimately the narrative authors had final say in the contents of their own scenarios. Once the narratives were complete, the lead authors tied the narratives together and published the monograph.

In conclusion, the results of my analysis of the Age of Consequences, including the information gained during the participant interviews, reveal that on the one hand, the exercise generally achieved its mandate, which was to “employ the best available
evidence and climate models, and imagine three future worlds that fall within the range of scientific plausibility” (Campbell et al. 2007, 5-6). The participants I interviewed all seemed satisfied that the results were meaningful to the intended audience—the policy community in Washington, D.C. On the other hand, the Age of Consequences was not a scenario planning exercise that followed a specific planning methodology. The impact of the exercise is difficult to ascertain—only one of the interview participants indicated that she thought the exercise had an effect on policy within the defense and foreign policy community, but she admitted it is extremely difficult to link any specific policy or policy change directly to the Age of Consequences. The other three participants were more reluctant to directly link the exercise with any policy or policy change. All four participants generally agreed that the Age of Consequences was ground breaking in some way, especially in opening up dialog on the relationship between climate change and security:

“[Age of Consequences] was a real lesson about these things….it informed] more broad policy, like the Quadrennial Defense Review mentioning climate change. It sort of changed the narrative in a way that made it OK when the Chief of Naval Operations decided to appoint someone as the lead on climate change. No one really pushed back, really heavily. And the Bush administration changed their stance on climate change as well. There were a lot of things happening that made it more OK for the defense community to care about these issues, and I think it really helped with that narrative” (SP-8).

Although the Age of Consequences did not follow a specific scenario planning methodology, such as intuitive logics, it does represent an attempt to create a set of plausible futures focused on the security impacts of climate change. The scenarios challenge strategic planners and policy makers to think in new ways, to think long term (well beyond the typical 5 year strategic planning horizon), and to consider the impacts of
a complex, long term, uncontrollable problem. For these reasons, *Age of Consequences* was an appropriate scenario exercise to analyze in depth. My analysis revealed important shortcomings in the *Age of Consequences*, which I address in the following section.

**Insights into Scenario Planning: Spatial Scale, Uncertainty, and Surprise**

Both sets of interviews yielded insights into the incorporation of spatial scale, uncertainty, and surprise in scenario planning. In this section, I first present results of the *Age of Consequences* interviews that address these three important (and often neglected) areas, and then results from the interviews with scenario planning experts.

The *Age of Consequences* scenarios did not explicitly incorporate or address spatial or institutional scale. The three scenarios focus primarily at the global level, with occasional reference to a regional level. There is no discussion in any of the three scenarios about drivers or indicators acting across multiple spatial levels. Consensus by all four respondents indicates that they were constrained to focus primarily at the global level because that was the only level for which they had accurate climate projections (though this seems to be a misperception, because one of the participants helped to assemble regional climate information drawn from the IPCC; Table 3-2). One author states,

“There was not a methodological outline of what regional scales I should consider in my scenarios. I think I took cues from the discussions that we had, that people wanted to talk about the Middle East, people wanted to talk about migration from North Africa to Europe and Latin America to the U.S. So I got a sense that North vs. South was important….So I took cues from the place-based scenarios that the security authors talked about in scoping meetings and those expert input meetings….As far as where I got the information on the regional stuff, it came right out of the IPCC
The exercise did address temporal scale in very simple terms—two of the scenarios examined security implications of climate change over 30 years; one of the scenarios looked out 100 years. The scenario experts were much more direct about the importance of considering scale in scenario exercises (Table 3-2). All scenario experts conceded the difficulty in incorporating scenario drivers or emergent properties over multiple spatial levels, and stated they had rarely or never been involved with rigorous multilevel

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**Age of Consequences Participants:**

After Age of Consequences was done, we went back and looked at the 2007 IPCC report again, and realized, due to the modeling and science, the projections are global in scale—aggregate. They’re not country level at all. I think the Age of Consequences reflects where climate science was at the time.

There was not a methodological outline of what regional scales I should consider in my scenarios. So I took cues from the place-based scenarios that the security authors talked about in the scoping meetings. As far as where I got the information on the regional [data], it came right out of the IPCC report. It’s the same degree of regionalization that the IPCC report provided.

We did look at [spatial scale]. You couldn’t model the regional environments—you had to sort of do it at the global level and you put regional politics into the model. Global trend lines was all you could do on the science itself.

**Scenario Experts:**

We want scalable methodologies. We want to be able to take things that were global processes and scale them down to regional impacts, and then back out into why those regional impacts are important locally…So we explicitly try to link the global with the local as much as we can.

[Scale] has to be explicitly dealt with…We need to know from what geographical scale, and that’s why we like to provide maps, so we can provide a blank canvas of the world…You don’t want to restrict it too much—the whole point is to make people aware how any particular factor can slide up and down the geographical scale from local to global and back down—regional.

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**Table 3-2 Interview responses addressing spatial scale in scenarios.**

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The difficulty in addressing multiple levels during scenario exercises presents a limitation of the scenario approach. Generally, scenarios are intended to reduce complexity, to help participants think broadly about complex problems without getting mired in detail. Attempting to incorporate drivers working over multiple spatial levels,
for instance, could quickly add significant complexity to an otherwise simple scenario exercise. The four Age of Consequences participants varied in their understanding of how the scenario exercise addressed uncertainty. One participant noted, “My intent in doing this scenario was to deal with complexity and uncertainty, since they’re essentially Siamese twins. I don’t think that reflected the approach that the other authors used” (SP-3). Another participant came away from the exercise more pessimistic about his perception that the social sciences are unable to deal with or anticipate uncertainty. There does not appear to have been any upfront discussions about addressing or identifying uncertainty at the beginning of the exercise. More structured scenario approaches typically begin by identifying critical uncertainties (Chermack 2011), but that does not appear to be the case in the Age of Consequences.

The scenario experts, on the other hand, demonstrated a much more positive view of how scenarios address uncertainty. Two experts explained that they always define uncertainty at the beginning of scenario exercises, using a combination of read-ahead material for participants, and clarifying uncertainty during their introduction to the exercises (Table 3-3). Another scenario expert acknowledged that discussing uncertainty in terms of the direction of change is the start of any scenario planning process: “You don’t want to pick drivers that are (a) very predictable or (b) you have no control\textsuperscript{13}. So yes, there is a lot of discussion of [uncertainty]” (SP-5). The scenario experts agreed that one of the primary purposes of conducting scenario planning is to help participants

\textsuperscript{13} The selection of drivers over which planners or decision makers have no control contradicts scenario planning practice—scenario planning is especially appropriate for examining complex problems over which we have little or no control (see discussions in Chapter 2).
“recognize that there are multiple possible ways in which different scenarios can unfold, and we may not have control over them” (SP-6).

Age of Consequences Participants:
I’m very pessimistic about dealing with uncertainties [related to social science]. From what I’ve learned over the past few years about the social sciences, we simply don’t have the data that are needed to deal with [uncertainty], so…I don’t think [scenarios] help you very much beyond forcing you to consider different triggers, which is important. I think that’s where it’s useful.

My intent in doing [the Age of Consequences] was to deal with complexity and uncertainty, since they’re essentially Siamese twins. I don’t think that reflected the approach that the other authors used.

Scenario Experts:
I think uncertainty is one of the key elements of the whole process. People need to be made aware that they have to embrace the notion of uncertainty, and that is the very foundation of the whole [scenario] process. It’s about seeing that there is no certain future path—that we have to recognize that there are multiple possible ways in which different scenarios can unfold, and we may not have control over them.

[Uncertainty] is the start of any [scenario] process.

For the scientific audience we’ll define [uncertainty] technically in terms of epistemic uncertainty or methodological uncertainty, or the different types they might encounter. We really tend to say that people should focus on the uncertainty as a way to highlight what is most important [in the scenario development]. You can focus all day on what we know already, but what the scenarios get out is to help us identify the boundaries of what we know, and what might exist beyond those boundaries. What we found with the military is that the uncertainty was the most valuable part of doing those analyses….Ultimately [uncertainty] is most interesting to us.

Table 3-3 Interview responses addressing uncertainty in scenarios.

Finally, as discussed previously, surprise represents a unique type of uncertainty.

Interviews with the Age of Consequences participants revealed that there was no discussion of using the scenarios to help identify surprise—all of the scenarios were generally linear, summarized by one participant: “Even the worst case was all very linear, based on what we thought of climate impacts at the time. Basically things get bad and continue to get bad over time and it ends up in a catastrophic place over time if we don’t intervene….Even the catastrophic scenario didn’t touch on surprise” (SP-1). The scenario experts, in contrast, all discussed how scenarios help identify possible surprises
(Table 3-4). One scenario expert highlighted a challenge when a surprise is identified or proposed in a scenario narrative—that occasionally there will be resistance to surprise by certain participants. According to the expert, sometimes this resistance is legitimate, other times it indicates an unwillingness to suspend disbelief, despite coaching and guiding by facilitators, which can be harmful to effective scenario planning.

Age of Consequences Participants:
For the outcomes of the scenarios themselves, I think there were no expectations going in, because [climate change-security] was a new area. There is nothing to surprise when you don’t have expectations.

Even the worst case was all very linear, based on what we thought of climate impacts at the time. Basically things get bad and continue to get bad over time and it ends up in a catastrophic place over time if we don’t intervene….Even the catastrophic scenario didn’t touch on surprise.

I was more concerned about the impact of surprise on policy making systems…I was interested in surprise, especially since an examination of complexity theory at the level I can understand it teaches you some things about policy…Complexity theory teaches you that surprise is endemic to human affairs, if you want to extend it to human affairs….And in thinking about policy it is necessary or important to keep in mind the potential for surprise, and the problem that our optics as human beings impose on an assessment of where we are going, how fast we’re going, and what might be in front of us.

I don’t think [we discussed] surprise. The catastrophic scenario was distinguished by large-scale discontinuities kicking in, but they were not discussed in terms of surprise.

Scenario Experts:
Sometimes [scenario building] is a confluence of events in a storyline that will lead you down a certain path, and it may be something you didn’t even consider.

We do bring up surprise very explicitly [when leading scenario exercises].

[Surprise] is something we bring up explicitly, especially within the context of our work with the Air Force. We are particularly interested in what are those possible surprise scenarios—we want to dig those out and shine light on those…What we want to do is create a whole suite of issues and environmental, political, social scenarios that perhaps can create certain problems that we don’t want to be surprised if they do happen.

Table 3-4 Interview responses addressing surprise in scenarios.

Suitability of Scenario Planning for Exploring Policy and Research

All of the interview participants have extensive experience with foreign or national security policy. I asked both groups if they thought scenario planning was a
useful method for exploring policy or research. Among the *Age of Consequences* participants, who had extensive policy experience but little or no scenario experience, answers were varied. Two of the four did not think scenarios were especially useful for exploring policy options or testing policy. One did not have an opinion, and one (with the least policy experience) replied:

“I definitely do. That’s really the point of it, I would say. If you’re not trying to figure out what decisions to make why are you doing it in the first place. Absolutely. In the most general sense, the reason is that you might make a different decision if you understood that there is a range of possible outcomes that differ, right? If you realize that the uncertainty is such that there are a number of equally plausible scenarios or even if they’re not the only plausible, if the consequences are very different—one is very, very severe and the other is not—you would want to consider that in making the decision. So I think that’s the value of scenario casting in an uncertain world” (SP-1).

The scenario experts saw more utility in scenario planning as tool to explore or test policy and identify areas for research. One expert stated, “The real point of doing scenarios is to give capabilities to the planners so they can work through both understanding what the different policy options are, and what the potential impact of those policies is” (SP-4). Another expert said, “I think scenarios are essentially a tool that can be used in any decision making arena, because what it’s useful for is the whole exploratory process of finding complexity and becoming much more aware of it. Within the policy realm, it’s something that should be used a lot more” (SP-6). When asked about the utility of scenario planning for establishing or focusing an academic research agenda, the responses among all respondents varied considerably—three thought scenario planning would be useful in this area, three thought it would not, and two had no opinion.
Finally, interview participants agreed that scenario planning was useful for learning. The *Age of Consequences* participants walked away from their experience with that particular scenario exercise having learned from other experts in the working groups (Table 3-5). The scenario experts observe learning taking place in the scenario exercises they participate in and facilitate. The learning includes social learning, cognitive learning, and constructive learning (Chermack 2011). The interview responses indicate that learning among participants is one of the more significant outcomes of scenario planning exercises (Table 3-5). The didactic value of scenario planning was summarized best by the most experienced participant:

“What I love about scenarios is they train the mind….You can learn a lot about what to look for at least in the application of policies under conditions of uncertainty. And it just might save blood and treasure, because you would be more alert to the possibility of error….For me, the more important value is systematic foresight, which I think can be organized and processed….I think it can be built into an organizational effort and I think there are ways then to integrate that with policy making, providing you don’t expect to be doing it when the crises hit the fan” (SP-3).

To summarize, most interview participants agreed that scenario planning is useful for exploring or test policy (or the absence of policy) as applied to complex socio-environmental problems. Interestingly, those who did not think scenario planning was useful for policy were the most experienced policy analysts. Their response may have been a result of not understanding scenario methodology (recall that the *Age of Consequences* was not structured like a traditional scenario exercise), or it may have been a result of their personal biases or experiences with policy planning, which has not involved scenario planning. Interview participants did not have a strong opinion about the potential of
scenario planning to focus or establish scholarly research—most responses to this question indicated they had never considered this use of scenario planning.

Finally, all respondents agreed strongly that scenario planning is useful for learning, especially among participants.

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**Age of Consequences Participants:**

There’s this cross-fertilization that goes on because it’s a very interdisciplinary undertaking, and my sense is that all the authors learned a lot from other authors, primarily [about] the science and the security aspects.

I think we learned a lot from Age of Consequences. These were scenarios for sure, but it was really more a thought exercise, at least the final product.

What I love about scenarios is they train the mind….You can learn a lot about what to look for at least in the application of policies under conditions of uncertainty. And it just might save blood and treasure, because you would be more alert to the possibility of error….For me, the more important value is systematic foresight, which I think can be organized and processed….I think it can be built into an organizational effort and I think there are ways then to integrate that with policy making, providing you don’t expect to be doing it when the crises hit the fan.

I don’t know if [the exercise] was an opportunity for [the other participants] to write about what they’d been thinking, or learn from others—I certainly did [learn].

**Scenario Experts:**

Ultimately that’s what we’re really looking for when we do these scenarios, is to get pushed beyond our normal ways of thinking, so suddenly we’re talking about something that no one has talked about before. If we can manage that, that’s where we really come across with the valuable deliverables.

That is one of the most important elements of the workshop—to teach people how to think broadly, and anticipate, and work with other experts in a fairly open environment, and to develop their own observational thinking skills.

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**Table 3-5 Interview responses addressing the value of learning during scenario planning.**

**Methodological Reflections**

All of the prospective participants for this research could be classified as “elite”—that is, a high level professional with extremely limited time, serving in a position of power or influence, to whom access is limited. Although not a part of my initial research plan, I gained important insights into interviewing elites that are noteworthy. Gaining access to and interviewing elites confirmed some of the challenges I anticipated (Conti
and O’Neil 2007). Gaining access to the participants proved to be very difficult. Of the nearly twenty elites I attempted to contact—individuals who had participated in one of the two published climate change-security scenarios—I was only successful in gaining access to six. Of those six, I was able to set up interviews with four. Likewise, of the approximately ten scenario experts I contacted, I was able set up interviews with four. When attempting to make contact and then conduct the interviews, I self-identified as both a doctoral candidate and a lieutenant colonel in the U.S. Army. Of the eight interviews I was able to conduct, I estimate that at least four of those happened because of my position and identity as a U.S. Army officer. In two of those interviews, my identity and credentials as an Army officer facilitated physical access to the interview location—one interview conducted at the Naval Observatory in Washington, D.C., and another at the Pentagon. Although the participants all knew that I was an Army officer, I did not highlight my professional background prior to or during the interviews, unless the participant asked me specific questions. I wore civilian attire to the interviews. Nonetheless, in nearly all of the interviews that I conducted with mid-grade professional elites, there was a sense of having a peer-to-peer discussion. In two of the interviews, conducted with very senior elites, I felt subordinate to the participant. In these two interviews, the participant at times interrupted the questioning, but was never disrespectful, and I was always able to move the interview back to my questions. I think that all of the interviews would have been more challenging to schedule and conduct had I not been a middle aged Army officer.
Discussion

The research conducted for this dissertation is first and foremost a study of a method—scenario planning. The data collected and analyzed for the phase of the research covered in this chapter reveals significant information about scenario planning, especially as it has been applied to a set of complex socio-environmental problems. The analysis of the data collected for this phase of research helps us understand how scenario planning may be employed more effectively and rigorously to explore and plan in light of complex socio-environmental problems. The results of this phase of research support several conclusions about scenario planning. In this section I focus on scenario planning as learning events, the importance of precise language in scenario planning, the value in establishing scenario planning theory, and the lack of attention to scale in scenario planning.

Scenarios as Learning Exercises

Scenario planning offers a useful method to learn more about complex, uncontrollable problems, including climate change-security issues—the experiences of all interview participants supports the utility of scenario planning, though sometimes for different reasons. Some find scenarios useful as a thought or learning exercise. Others find scenarios useful for exploring policy options or implications, or areas that require scholarly research. Scenario experts tend to view scenario planning as a useful tool for identifying areas of critical uncertainty, unexpected drivers of change, or surprise. Scenario planning can bring together diverse groups of stakeholders and decision makers
around a common problem, fostering dialogue, improving learning, and helping to identify critical uncertainties and possible solutions to or interventions in complex problems.

**Scenario Language**

A lack of precise terminology, or confusion about the definition of certain terms among participants causes problems when discussing scenario planning, and when conducting scenario planning exercises. Terms such as *scenario, scale, surprise, uncertainty,* and *risk* mean different things to different people—I observed this during each interview, and in many instances it caused me to have to define or explain terms more precisely in order to allow the interview to continue in a meaningful direction. Likewise, during scenario planning exercises, defining and explaining these key terms and concepts up front is very important, as mentioned by each of the interviewed scenario experts. Additionally, if the results of a scenario planning exercise are to be published, those key terms and concepts should be clearly defined up front. One way to tighten scenario terminology among practitioners is to strengthen scenario planning theory.

**The Value of Scenario Planning Theory**

The absence of discussion or debate about scenario planning theory detracts from the rigor of scenario planning as a method and hinders debate about scenario methodology. For the past three decades, scenario practitioners have focused almost
exclusively on scenario planning *products* at the expense of scenario planning *processes* (Chermack 2011). None of the interviewed scenario planning experts expressed any knowledge of scenario planning theory. This point underscores a problem that is especially prevalent in the policy community—an abundance of planning and analysis being conducted in a theoretical vacuum (Swanson and Chermack 2013). Only one of the six domains of Chermack’s SPT was addressed in *Age of Consequences* (Table 3-2). Of note, three of the four scenario experts interviewed expressed significant interest in Chermack’s SPT when I introduced it to them during follow up discussions after the initial interviews.

As scenarios gain popularity, the variety of scenario methods has increased. A scenario planning theory allows scenario practitioners to test new scenario methods using an established theoretical framework. In the end, such a framework adds credibility to a method, and to the rigor and transparency of scenario planning exercises. Greater transparency in the scenario planning process enhances credibility and rigor to published scenarios, and foment debate about appropriate scenario methods, not just among scenario practitioners, but also among scholars, analysts and decision makers who employ scenarios or scenario results.

Finally, an understanding of scenario theory is not essential in order to conduct a meaningful scenario planning exercise; however, introducing scenario planning theory may provide a meaningful framework to help scenario participants understand the background and purpose of scenarios. Explaining or presenting a scenario planning theory at the beginning of a scenario exercise, or in read-ahead material when key terms and definitions are presented, would add methodological rigor to the exercise, and
demonstrate to participants the epistemological advantages and limitations of scenario planning. For example, had the _Age of Consequences_ exercise included scenario theory and a description of key terms, participants may have collaborated more effectively and frequently. The published results of the exercise would be more academically rigorous—clearly not a concern among many in the policy community, but very important to some scholars. The _Age of Consequences_ participant most critical of the lack of methodological rigor during the exercise was the lone scientist in the exercise.

**Attention to Scale**

The only existing scenario planning theory, Chermack’s SPT, fails to include scale as an essential domain. The results of the _Age of Consequences_ scenario exercise demonstrate a lack of attention to spatial and institutional scale, and an absence of any explicit thinking about multilevel interactions of drivers or emergent properties. The interviewed scenario experts acknowledge the importance of thinking about and including scales and levels before and during scenario planning exercises, but inclusion of scale in framing a scenario exercise seems dependent on a particular scenario method or technique, or on the group or individual leading the exercise. The addition of scale as a domain in SPT would improve its application to organizational scenario planning in the
<table>
<thead>
<tr>
<th>Scenario Planning Theory Domain</th>
<th>Addressed in <em>Age of Consequences</em>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dialogue, Conversation Quality, and</td>
<td>Limited, and only during the</td>
</tr>
<tr>
<td>Engagement</td>
<td>development of the scenarios; not</td>
</tr>
<tr>
<td></td>
<td>discussed in the results published</td>
</tr>
<tr>
<td></td>
<td>in monograph or book.</td>
</tr>
<tr>
<td>Learning</td>
<td>Yes, including social learning among</td>
</tr>
<tr>
<td></td>
<td>group members, and cognitive learning</td>
</tr>
<tr>
<td></td>
<td>based on feedback during interview.</td>
</tr>
<tr>
<td>Decision Making</td>
<td>No; no discussion of decision making</td>
</tr>
<tr>
<td></td>
<td>processes in publications, though</td>
</tr>
<tr>
<td></td>
<td>results clearly intended to influence</td>
</tr>
<tr>
<td></td>
<td>decision makers/policy makers in the</td>
</tr>
<tr>
<td></td>
<td>defense and foreign policy</td>
</tr>
<tr>
<td></td>
<td>communities.</td>
</tr>
<tr>
<td>Mental Models</td>
<td>Not assessed; scenarios were</td>
</tr>
<tr>
<td></td>
<td>developed by individual chapter</td>
</tr>
<tr>
<td></td>
<td>authors based on their own mental</td>
</tr>
<tr>
<td></td>
<td>models, which were not included in</td>
</tr>
<tr>
<td></td>
<td>the results.</td>
</tr>
<tr>
<td>Leadership Support</td>
<td>Not an objective of this scenario</td>
</tr>
<tr>
<td></td>
<td>project.</td>
</tr>
<tr>
<td>Organization Performance and Change</td>
<td>Not an explicit objective of this</td>
</tr>
<tr>
<td></td>
<td>scenario project, though broadly</td>
</tr>
<tr>
<td></td>
<td>intended to stimulate thinking and</td>
</tr>
<tr>
<td></td>
<td>shape U.S. policy.</td>
</tr>
</tbody>
</table>

Table 3-6. The six domains of Chermack’s SPT in the *Age of Consequences* scenario exercise. Based on analysis of *Age of Consequences* report and results of semi-structured interviews with participants.

business community—business scenarios address temporal, institutional, and sometimes spatial scale. Any socio-environmental scenario that seeks to explore policy or research must address and incorporate scale (temporal, spatial, and institutional; Wilbanks and Kates 1999). I propose the addition of scale as a critical domain of scenario planning theory, which I address in the final chapter of this thesis.
Conclusions

This chapter began by briefly reviewing two existing climate change-U.S. national security scenario exercises that have been conducted and published. One of these, the *Age of Consequences*, was explored extensively through analysis of the published monograph, and in a series of interviews with participants. Additionally a small group of scenario experts, with experience in climate change-security or environmental security scenarios, was interviewed. The chapter presents the first phase of original research conducted for the dissertation, with the purpose of answering the first overarching research question: how does scenario planning deal with issues of multiple scales, levels, and surprise in addressing uncertainty associated with complex socio-environmental problems, such as climate change and security? The answer, as it relates to the focus of this research, is that the only published example that approaches a climate change-security scenario planning exercise—the *Age of Consequences*—did not deal explicitly with multiple scales, levels or surprise. However, participants in that exercise, as well as scenario planning experts, see potential for scenarios to deal with spatial scale and surprise more explicitly, and generally agree that doing so improves the effectiveness of scenario planning. According to the scenario planning experts I interviewed, scale, especially spatial scale, must be an integral part of scenario planning, and while dealing with multiple levels can be very challenging for scenario participants, doing so adds rigor to the exercise—when time and resources are available, it can help to create a more comprehensive scenario, and ensures participants consider drivers or responses that may act across multiple levels. To date, few scenario exercises formally consider multiple
institutional or spatial levels (Kok et al. 2006b; Biggs et al. 2007), but consideration of multiple levels strengthens scenario planning and analysis (Döll et al. 2008). Finally, participants in the *Age of Consequences* did not consider surprise in their exercise, but they did find that the exercise helped identify or understand areas of uncertainty related to the particular complex problems they addressed. The scenario experts were quicker to indicate the usefulness of scenarios as a tool for trying to both identify critical uncertainty, and identify possible areas of surprise.

To summarize, the results of this phase of research yield both practical and theoretical implications. Practically, the research confirms the didactic value of scenario planning (Chermack 2011, Glick et al. 2012) for understanding and planning in light of complex socio-environmental problems (Wilkinson and Eidinow 2008; Rounsevell and Metzger 2010), such as the national security implications of climate change (Lewis 2014). Scenario practitioners and group facilitators should employ precise, common terminology, and clearly defined methods. This research supports findings in the broader scenario literature that there exists a strong focus on scenario products, with much less emphasis on scenario processes (Chermack 2011, Amer 2013). The emphasis on product hinders transparency in the scenario planning process, and undermines the credibility of scenario planning as a method, or the results of specific scenario exercises.

Theoretically, there is a complete absence of understanding or discussion of scenario planning theory among scenario experts, confirming gaps identified by Chermack (2011) and Swanson and Chermack (2013). The only existing scenario planning theory (Chermack 2005, 2011) is well suited for business practitioners, but may be more robust if expanded to include scale as one of its primary domains. The next phase of
dissertation research, addressed in Chapter 4, builds on the lessons learned and implications of this first phase of research.
Chapter 4 - Foresight Scenario Planning: A Case Study of Scenario Planning on Environmental Security in Vietnam

The future often acts like a drunken monkey stung by a bee—it is confused and disturbing, and its behavior is completely unpredictable.

-Thomas Chermack

Introduction

Governments, NGOs, and businesses all face changes that affect their futures. In facing the future, these organizations have options—they can ignore the future, muddling through and hoping for the best; they can attempt precise prediction of the future, using an array of methods and techniques that have become increasingly sophisticated with the advent of supercomputing; or they can envision an array of possible or plausible futures, and in doing so look for common trends, gaps in existing knowledge, or potential ‘wild card’ events. Scenario planning offers a systematic technique to envision an array of plausible futures. Scenario planning methods vary considerably, and include very complex scenario planning exercises that involve dozens of experts for weeks or months (Project Horizon Progress Report 2006) or standing scenario planning groups that meet regularly or periodically to update ongoing scenarios (Shell 2011; National Intelligence Council 2008). But scenario planning can also be employed on a much smaller scale, as short-term or stand-alone exercises conducted by small groups of experts or stakeholders with minimal resources. The scenario planning exercise discussed in this chapter represents just such a small scale scenario planning exercise.

The purpose of this chapter is to present the preparation, conduct, and results of a case study—a small scale, stand-alone scenario planning exercise that represents an effort
to bring together a diverse group of experts to harness their collective knowledge in order to create a set of plausible future scenarios focused on a specific place and problem. The study examines the scenarios created—the *product*—but also, and perhaps more importantly, the *process* of scenario creation. The group of participants included scholars and policy analysts from a wide range of disciplines. Although the participants are experts in their respective fields, most had little or no previous experience with scenario planning, and few had worked together before the event. The focus of the scenario planning exercise was environmental and energy security in Vietnam and Southeast Asia over the next ten to twenty years. Working in small groups, participants employed a novel method to develop narrative scenarios, identify critical uncertainties, and posit possible interventions.

The purpose of this case study was to provide insights into scenario planning processes, how those processes influence the resultant scenario products, thereby addressing previously identified gaps in the existing scenario literature. The goals of the case study are:

- to test a novel scenario building method in order to determine its usefulness in understanding complex, multilevel socio-environmental problems;
- to gauge participant learning during the scenario planning process;
- to assess dialog and engagement;
- to assess participant mental models employed during the scenario building process.
Within the framework of the scenario exercise, I established goals for the participants. Upon completion of the scenario exercise, the participants, working in small groups, were to:

- create a plausible scenario;
- identify uncertainty associated with their respective scenario; and
- identify possible solutions for (or preventative measures to avoid) such problems (referred to as interventions).

As noted in the literature review in Chapter 2, results of a growing number of socio-environmental scenario exercises have been published, including scenarios for agricultural land use (Abildtrup et al. 2006), desertification in the Northern Mediterranean (Kok et al. 2006b, 2006a), management of community forests (Wollenberg et al. 2000), dryland development (Enfors et al. 2008), environmental impact assessments (Berkhout et al. 2002), and local impacts and adaptation to climate change (Dietrich 2013; Tschakert et al. 2014). These scenarios cover a wide range of spatial levels. Most focus on the scenarios developed, rather than the scenario development process (with Dietrich (2013) and Tschakert et al. (2014) being exceptions). In this case study, I set out to answer questions related to the process of scenario development:

- How were the scenarios created?
- What did the participants expect of the process, and were those expectations met?
- Did participants learn during the scenario planning process?
How do participants address issues of spatial scale, and can they incorporate multiple spatial levels in a simple scenario exercise?

How do participants deal with surprise?

Based on my survey of the literature, the most common scenario method employed today is the intuitive logics approach (Amer et al. 2013). When using the intuitive logics approach, a group developing scenarios identifies two critical drivers, such as water availability and political stability, and then bases the scenarios on the interplay of those two drivers. The two drivers are plotted against one another on an x- and y-axis to create up to four scenarios (see example in Figure 4-1). This scenario method offers some advantages: by limiting the number of drivers on which participants must focus, it can be a relatively straightforward approach; also, since the method is used widely, it is often familiar to participants; and, if appropriate drivers are selected, it helps participants think broadly or strategically, as opposed to becoming mired in tactical details. Nonetheless, the intuitive logics approach has some limitations (Amer et al. 2013). First, this approach often requires significant preparation time and expert knowledge before starting the scenario exercise in order to identify the two most significant scenario drivers. Chermack (2011) provides a comprehensive, practical guide to conducting an intuitive logics scenario planning exercise, and concedes the significant effort and expense in the preparation phase. Special types of intuitive logics scenario exercises, such as participatory scenario planning, can be especially resource intensive during preparation (Enfors et al. 2008). Second, based on my experience with intuitive logics scenarios, once the two critical drivers are identified, participants may feel
constrained, especially if those drivers are unfamiliar to them. Though the simplicity of working with two critical drivers can help participants focus and more easily develop scenario narratives, that same focus on two drivers can inhibit creative thinking (Toth 2008). Finally, the two scenario drivers may function or operate at the primary or initial spatial level of focus in the scenario, but may not be important at lower or higher spatial levels, which can complicate or inhibit multi-level thinking. The intuitive logics approach remains an important and useful scenario method, but because of these limitations, it did not suit the requirements of this case study.

Figure 4-1 Intuitive Logics 2x2 Matrix. An example of a 2x2 intuitive logics scenario matrix of a climate change adaptation exercise for Iraq. Each axis represents a critical driver—the x-axis is political stability; the y-axis is water availability. The combination of these two variables leads to four plausible scenarios, named in each of the four quadrants of the matrix. Source: Read (2012, 72).

To attain the goals of the case study and attempt to answer these questions, I employed a recently developed scenario planning method—one that has not been widely
used to date (Briggs 2010; Briggs and Briggs 2011). *Foresight scenario planning (FSP)* allows small groups of three to eight participants from diverse backgrounds to create scenarios using two to four (or more) drivers that are drawn randomly from a larger set, or deck, of relevant drivers. The group decides how and when to incorporate the drivers they select. Participants use their knowledge and expertise to create narratives about their topic that incorporate the drivers they have drawn—how those drivers affect change or interact over time and across spatial or institutional levels. The method has been used at the Department of Energy, and refined and employed at workshops as part of the Air University Minerva Initiative (Briggs 2010; Briggs and Briggs 2011). During the scenario exercise, I tested this scenario method, assessing its utility for complex problems related to environmental security broadly, and climate change-security more specifically. This scenario method seemed especially useful when working with diverse groups of experts or stakeholders, and in a resource-constrained context. I was especially interested to determine if this particular scenario building method could be employed to address multiscale, multilevel problems and surprise.

Foresight scenario planning addresses some of the limitations of the intuitive logics approach, and it is especially useful in a time-constrained environment (Briggs 2010). First, participants do not spend time trying to identify two critical drivers upon which to base their scenarios—instead, they select from a “deck” of prepared drivers, saving time and allowing groups to focus on scenario development. Second, participants may incorporate more than two drivers (but usually not more than four), and may do so in any order (simultaneously or sequentially), giving participants flexibility in scenario development, fostering critical thinking, and improving participant dialog. Third, the
more loosely constrained, random incorporation of drivers fosters thinking that is more likely to identify potential “wild card” events or surprises. And finally, although multilevel spatial thinking remains a challenge, FSP enables a flexible scenario creation that, with proper facilitation, can address multilevel spatial issues. FSP is discussed in more detail below.

Methods

During conduct of this case study, two sets of methods were employed. As the primary investigator, I employed one set of methods to collect data during the scenario exercise, and then analyze the data; a different set of methods was used by participants for the exercise itself—from here forward I refer to the second set of methods as the scenario methods, and I discuss it in the following section, where I address the selection of exercise participants, exercise preparation, and exercise conduct.

Data Collection and Analysis Methods

Data collected during this exercise was primarily qualitative, and included a pre-exercise survey completed by each participant (to gather demographic information and participant expectations), audio recordings of group discussions (to capture the scenario development process of each group), audio recordings of final group scenario presentations, scenario diagrams created by each scenario group, observations of group discussion and interaction by the investigator, a narrative created by each group that
summarizes the group’s scenario, and a post-exercise survey from each participant (to
gauge participant satisfaction with the exercise and solicit feedback on the scenario
process). The pre- and post-exercise surveys (Appendix A) included a combination of
five-level Likert scale responses and open-ended questions. All participants consented to
me recording their group discussions, with the understanding that I would protect their
identity. Participants understood that Chatham House Rules were in effect for this
exercise—that all discussions and comments were to remain non-attributional.

Data analysis involved a series of steps. First, the Likert scale responses were
analyzed statistically. I listened to all audio recordings of group discussions, since I
could not be physically present during all three group discussions. I made note of
significant comments or discussions. The three scenario narratives were analyzed and
compared qualitatively. To facilitate comparison of the three scenarios, I created
diagrams of each scenario that highlight the scenario drivers, processes, and feedbacks. I
employed Chermack’s Scenario Planning Theory (SPT) as a framework to analyze each
group’s scenario development process, only using the categories of SPT that applied to
this type of scenario exercise. Chermack’s SPT includes six domains: dialogue,
conversation quality, and engagement; learning; decision making; mental models;
leadership support; and organization performance and change. Because the exercise
conducted for this case study was a stand-alone event (not part of an existing
organization), I used four of Chermack’s six domains to frame my analysis: dialogue,

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14 All research for this dissertation involving human subjects was approved by The Pennsylvania State University Institutional Review Board, IRB#35285.
15 Chermack’s Scenario Planning Theory, discussed in detail in Chapter 2, is the only existing scenario planning theory. Although SPT focuses primarily on scenario planning conducted in organizations, it applies more broadly, and is useful for stand-alone scenario planning events like the one conducted for this case study.
conversation quality, and engagement; learning; decision making; and mental models. The remaining two domains (leadership support and organization performance and change) do not apply to this case study because the exercise was conducted by a mixed group of participants who are not part of an existing group or organization (such as a business or corporation, in which leadership support and organization performance are often a focus for scenario planning exercises). In addition to Chermack’s domains, I assessed how groups incorporated or addressed scale—I examined how their scenarios addressed temporal, spatial, and/or institutional scales, and if their scenarios included drivers working at multiple levels on these scales.

**Scenario Planning Methods**

The scenario exercise conducted for this case study was based on foresight scenario planning methods first used at the Department of Energy, and then further developed by Briggs and Briggs (2011). The exercise workshop was hosted by the Elliott School of International Affairs (ESIA)\(^\text{16}\) and the Partnerships for International Strategies in Asia (PISA)\(^\text{17}\) at the George Washington University in Washington, D.C., in February 2012. Working in collaboration with individuals at ESIA and PISA over a period of several months in late 2011 and early 2012, I developed a scenario planning workshop focused on environmental and energy security in Vietnam. The exercise focused on Vietnam for several reasons. First, ESIA and PISA, the workshop hosts, have ongoing research interests in Vietnam. Second, Vietnam is a country facing a wide range of

\(^\text{16}\) [http://elliott.gwu.edu/]

\(^\text{17}\) [http://www.gwu.edu/~pisa/]
environmental security challenges, and is vulnerable to effects of climate change, including sea level rise, changes in tropical cyclone frequency and intensity, and changes in temperature and precipitation patterns. At the same time, Vietnam represents an emerging market in Asia. Finally, U.S. security strategy is shifting toward a greater focus on the Pacific region, including Southeast Asia. The following sections discuss the methods employed during the case study exercise, including participant selection, exercise preparation, and the scenario development process.

**Scenario Participants**

I worked closely with the exercise sponsors at ESIA and PISA to identify potential participants for the scenario exercise. Fifty potential participants, mostly from the Washington, D.C. area, were invited, based on their expertise related to the scenario exercise. Invitees included members of academic institutions (faculty and graduate students), federal government employees, and members of non-governmental organizations with expertise in areas such as climate change, international relations, development, environmental security, economics, international law, defense, water resources, energy, and conflict, as well as regional experts. Twenty two of the invitees agreed to attend and participate in the scenario exercise, and eighteen showed up to participate. The eighteen participants included eight from academic institutions, seven from NGOs, one with a dual appointment at an academic institution and NGO, one from

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18 Participants were invited from the Washington, D.C., area due to budget constraints. The exercise was conducted on a very limited budget, and there was no money available for travel reimbursement for participants. Participants graciously volunteered their own time and paid their own travel expenses.
the Department of Defense, and one with a dual appointment at the Department of State and an academic institution. Most participants held advanced academic degrees, including five with doctoral-level degrees and eleven with at least one masters-level degree. Participants included twelve men and six women, and the group included two native Vietnamese scholars (one graduate student and one visiting professor), as well as several individuals who had lived, studied, or travelled in Vietnam and/or Southeast Asia.

When asked to identify their primary academic or professional area(s) of expertise, participants responded with a variety of answers, most relating directly to the focus of the scenario exercise (Table 4-1).

<table>
<thead>
<tr>
<th>Participant Areas of Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Political Science:</strong></td>
</tr>
<tr>
<td>East Asian Democratization</td>
</tr>
<tr>
<td>Legal and Policy Adviser</td>
</tr>
<tr>
<td>Science, Technology, and National Security Policy</td>
</tr>
<tr>
<td>South/East Asia History, Politics, Political Economy, Foreign</td>
</tr>
<tr>
<td>Relations</td>
</tr>
<tr>
<td>International Relations of Southeast Asia</td>
</tr>
<tr>
<td>International Security</td>
</tr>
<tr>
<td>Climate Policy, International Relations, EU External Relations,</td>
</tr>
<tr>
<td>Transboundary Conflict</td>
</tr>
<tr>
<td>Vietnam and Southeast Asia Politics and International Relations;</td>
</tr>
<tr>
<td>Active Learning Methods</td>
</tr>
<tr>
<td><strong>Climate Science/Environmental Policy:</strong></td>
</tr>
<tr>
<td>Social Science Methodologies, Water, Climate, African Regional</td>
</tr>
<tr>
<td>Knowledge</td>
</tr>
<tr>
<td>Water Policy, Climate Change</td>
</tr>
<tr>
<td>Energy and Environmental Security Policy</td>
</tr>
<tr>
<td>Natural Disasters, Climate Change, Displacement, Peace and Conflict</td>
</tr>
<tr>
<td>Climate change, adaptation</td>
</tr>
<tr>
<td>Environmental Security</td>
</tr>
<tr>
<td><strong>Other:</strong></td>
</tr>
<tr>
<td>Technology Assessment</td>
</tr>
</tbody>
</table>

Table 4-1 Academic and/or professional areas of expertise of case study participants; self-identified.
Only half of the participants claimed to have any experience with scenario planning (or other futures planning methods). A majority of participants (87%) claimed to be knowledgeable on issues of climate change and 90% of participants claimed to be knowledgeable on environmental security issues. Slightly fewer claimed to be knowledgeable about contemporary or historical issues in Vietnam (68%) and Southeast Asia (75%). Scenario participants arrived at the exercise with varying expectations for the event. All participants expected to learn something about scenario planning, and about Vietnam. A majority (75%) expected to learn something they might apply to their professional work, and all but one participant expected to expand their professional networks during the exercise (see Figure 4-2). At the recommendation of the sponsoring organizations (ESIA and PISA), in order to maximize participation (given that participants were busy professionals or graduate students and were volunteering their own time to attend), the exercise was limited to a one-day workshop style event. Based on the areas of expertise and expectations of the participants, I expected the outcomes of the scenario exercise to favor a U.S. perspective, though the presence of native Vietnamese scholars, and several participants with extensive experience on the ground in Southeast Asia, the Vietnamese perspective would be considered.
Figure 4-2  Pre-Exercise Survey Results. Scenario participants were asked a series of questions about their background and expectations. Colored bars correspond to the lower axis, indicating the percent of responses for each of the five Likert categories. The numbers on each bar represent the mean response, and correspond to the Likert scale on the top axis.

**Exercise Preparation**

Approximately one week prior to the workshop, participants were sent a read-ahead packet that included a nine page overview of the purpose of the workshop, the workshop agenda and timeline, the workshop design and process, and key terms important to the workshop. Additionally, participants were given the chapter of a recent publication that presented an overview of contemporary environmental security issues in

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19 Key terms and concepts defined in the participant read-ahead packet included: *security, vulnerability and fragility, critical uncertainty, possible vs. probable, and driver*. These represent terms that are both important to the scenario exercise, and terms that have a broad range of definitions. Given the diversity of the participants, as well as the time constraints for the exercise, it was important to define these terms ahead of time to help forge a common reference for participants during the exercise, and avoid spending workshop time discussing or debating terminology.
Vietnam (Thayer 2011), which served as a primer. The publication provided information on Vietnam’s geography, politics, and issues related to climate change and environmental security. The reading was selected to provide important background information, while attempting to present unbiased information. Participants were free to bring additional, related resources or references to the exercise, but none did so. Upon arrival at the workshop, participants listened to a 30-minute keynote presentation, “The Geopolitical Role of Vietnamese Natural Resources” given by Mr. Will Rogers of the Center for a New American Security, based on a recent report he co-authored (Cronin et al. 2012). Following the presentation, I reviewed the purpose and methods of the scenario exercise. Participants were reminded to establish a time frame for their scenario, to consider what spatial levels their scenario would address, how drivers may act or interact across spatial levels, including how fine or low level events may trigger higher level responses, or how global drivers may affect regional or national level events. Groups were also reminded to develop a complex interactions chart or map, using poster paper and sticky notes. Finally, participants were reminded that, at the end of the exercise, each group would give a five to seven minute summary of their scenario to the entire group of participants, and should be prepared to field questions from other participants about their scenarios. Each group was required to follow up the workshop by submitting a one- to two-page narrative summarizing their scenario. Participants were then given an opportunity to ask clarifying questions.
Scenario Development Process

The FSP employed during this exercise was designed to be detailed enough to allow diverse groups of participants to construct meaningful scenarios, yet simple enough to do so in a limited amount of time with individuals who had not worked together previously and possessed limited to no experience with scenario planning. At the beginning of the scenario workshop, participants were presented with the three goals of the exercise: to raise awareness of the complex nature of energy and environmental security risk issues, to provide an interactive forum so that participants felt invested in the issues, and to identify key risks or uncertainties to be explored in more detail (by researchers or policy analysts). In addition to relevant background information on Vietnam, and key definitions related to environmental security, participants were provided instructions in the read-ahead packet and by the PI at the beginning of the exercise.

The eighteen participants were divided into three working groups, with an effort to distribute subject-matter expertise and experience evenly among the three groups. Each group had a pre-designated leader and a recorder, both of whom participated in the scenario exercise. I gave verbal and written instructions to these three group facilitators prior to the start of the exercise—their primary role was to ensure their respective groups completed the overall requirement of developing a scenario by the end of the exercise. The scenario exercise began with each group conducting brief introductions among group members, then familiarizing themselves with the deck of seventeen possible scenario drivers (Table 4-2). Scenario drivers are topics or issues related to the area or problem
being studied, that may affect some sort of change in the system or systems being studied. The drivers for this exercise were adapted to be applicable for Vietnam and Southeast Asia, based on a similar set of drivers employed by Briggs and Briggs (2011). Each driver appeared on a one page driver card that provided background information, possible outcomes, risks, and references (Figure 4-3). Driver cards were designed to be simple and quickly understandable by participants, while providing enough information to clearly define the driver and give some examples of how the driver might play out or affect scenarios in the future. Then each group conducted a short

<table>
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<th>Scenario Drivers</th>
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<td>Energy Region Conflict</td>
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<td>Rise of Piracy</td>
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<td>Collapse of Global Fisheries</td>
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<td>Black Carbon &amp; Tibetan Ice Melt</td>
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<td>Increasing Number &amp; Severity of Tropical Storms</td>
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<td>Peak Oil</td>
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<td>Nuclear Renaissance…or Nuclear Proliferation</td>
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<td>Nuclear “Accidents”</td>
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<td>Rare Earth Mineral Supplies</td>
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<td>Trans-National Crime</td>
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<td>Fragility of Existing Energy Infrastructure</td>
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<td>Environmental Health and Disease</td>
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<td>Performance of the Global Food Production System</td>
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Table 4-2. Scenario drivers used for the exercise. Each of the scenario groups developed a scenario using four of these drivers, randomly selected by the group.

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20 A similar approach has been developed by Dr. Chris Luebkeman, Director for Global Foresight & Innovation, at Arup (www.arup.com). In 2009, Arup published a set of 175 driver cards called “Drivers of Change,” with drivers organized into seven categories: energy, waste, climate change, water, demographics, urbanization, and poverty. The set of driver cards includes a small book that discusses ways the cards may be employed, including brainstorming, creativity exercises, business ideas, design (e.g., architecture or urban planning), or initiating small group discussions. The instructions do not discuss scenario planning in detail.
(approximately 45 minute), two-driver scenario exercise as a warm up, to familiarize the group with the scenario building process and to facilitate discussion.

Once the warm up exercise was complete, groups reshuffled the driver deck so they did not immediately re-draw the same drivers they had used in the warm up exercise, and drew four drivers for their final scenario. Each group was allowed to incorporate their four drivers in any sequence. For example, a group could draw four drivers at the beginning of the exercise, but introduce one driver at a time into their scenario. Or, a group could begin by drawing two drivers, start their scenario development, and then draw additional drivers to introduce at a later time in the scenario narrative. Groups had the freedom to discard a driver, replacing it with another driver if they determined a particular driver too difficult to incorporate in their scenario, or if they deemed a driver too similar to a previously drawn driver. With 17 drivers to choose from, there were 2,380 possible combinations of 4 drivers. Each group had approximately three hours to develop a plausible storyline scenario that incorporated their four drivers. The scenario narrative had to relate to Vietnam in some way, but groups had the latitude to establish their own temporal and spatial levels of focus, so long as their scenario narratives incorporated all four of the groups drivers. During the scenario instructions, group leaders were encouraged to consider a five to ten year horizon. Such a horizon would take scenarios beyond a typical strategic planning horizon of three to five years, but would not push the scenarios too far into the future, where uncertainty surrounding many of the drivers increases beyond a level that participants would be able to address adequately during the time allowed for the exercise. Most groups created scenarios that spanned ten years from present (2012).
Results

As with the discussion of methods, the results are divided into two sections: the results of my research on the scenario development process, which I frame using the applicable domains of Chermack’s SPT, and the results of the scenario exercise (primarily a summary of the scenarios produced by each of the three scenario planning groups—or the product).
Scenario Development: The Process

The results presented here focus on the observations and comments most salient within the framing provided by Chermack’s SPT. Chermack proposes six domains of scenario planning: dialogue, conversation quality, and engagement; learning; decision making; mental models; leadership support; and organization performance and change. The final two domains (leadership support, and organization performance and change) pertain to scenario planning conducted within an existing organization, such as a corporation. These two domains are less relevant in the context of the one-time scenario exercise conducted for this research. The scenario development process for this exercise did not include results in these two domains, so they will not be presented here.

Dialogue, Conversation Quality, and Engagement. The foresight scenario planning approach facilitated continuous dialogue among participants in each group, based on my observation and feedback from the group facilitators. Several factors contributed to participant dialogue. First, all invited participants had some level of interest in or knowledge of the problem(s) being addressed in the scenario exercise—environmental security, energy security, and/or Vietnam—and therefore had something to contribute to the conversation. As previously noted, participants were distributed based on expertise, so no one group was made up of participants from a single area of expertise. Second, participants were all provided with preparatory material that included a background reading that provided information relevant to the scenario exercise. Third, the exercise workshop commenced with a keynote address by a subject matter expert focused on energy security in Southeast Asia. I observed participants refer to the keynote
presentation four times, drawing on points made by the keynote speaker or integrating points that the speaker made into the group conversation. Finally, facilitators armed with a pre-established list of questions and familiar with the scenario planning process kept dialogue moving, drawing in ideas and comments from all group members, and keeping the dialogue on topic.

Based on my direct observations of groups, listening to recordings, and verbal feedback from the group facilitators following the exercise, the group conversations remained generally focused on the problems and questions set forth at the beginning of the exercise, and all members of each group participated in the conversation. Although each group had some participants who spoke more often than others, in none of the groups did I observe a silent participant. Important to engagement in this scenario exercise (and any scenario exercise) is the ability of participants to suspend disbelief within the context of the scenario development. I observed that all participants were able to suspend disbelief during the exercise, though I observed two participants in one group, on separate occasions, very concerned that a particular direction or decision made by other group members in the scenario development was “unrealistic” or “implausible.” Such comments highlight a challenge in scenario development—deciding when to proceed in a certain direction with a scenario, or when a particular path becomes implausible. In some cases, it is the responsibility of the facilitator to help arbitrate such a decision—this happened during this scenario exercise. In other instances, participants reminded one another that the scenario need not be “probable,” only “plausible.”

Each group was given a list of questions (Table 4-3) to help generate discussion and ensure their scenario attempted to answer key questions. In general, groups did not
systematically answer the questions posed to them on the group worksheets, although most attempted to answer the questions during their group discussions. Two of the groups became so focused on the scenario development that answering the questions was clearly an afterthought, and done in haste as group time was winding down. None of the groups recorded answers to the questions, despite being asked to do so during the initial instructions, and subsequent reminders.

Finally, throughout the exercises, the participants remain actively engaged—engaged with the process, engaged with one another, and engaged to develop a scenario. Group leaders had the authority to break when necessary during the three hour scenario development timeframe, but breaks for all groups were very infrequent, and often lasted only a minute or two. I observed participants from all three groups remaining aggressively engaged with the topics of discussion—groups required almost no guidance from group facilitators to stay on or get back on topic. In fact, the discussions in two of the groups became so engaged and focused that I felt it necessary to give hourly time reminders to the entire group, as a reminder to keep moving through the process, and that the scenarios needed to be wrapped up by the end of the three hour time limit.

**Learning.** Learning among participants appears to be one of the most significant positive results of this case study. On the post-exercise survey, all participants agreed or strongly agreed that they learned from the other members of their small group (Figure 4-4, Likert score of 1.5), and that the exercise caused them to think in new ways (Likert score of 1.3). Although interactions among the three participant groups was limited
Questions During Scenario Group Discussions

- What is the geographical focus? What spatial levels are important to include in your scenario?
- What are the starting conditions?
- Based on your scenario, what are the key vulnerabilities in the system?
- What are the critical intervention points in the system? Are there early warning signals that coincide with these critical intervention points that might prevent a worse situation?
- What critical uncertainties did you identify during your scenario development?
- What positive opportunities are available in your scenario? Who is affected by the positive opportunities, and how?
- Of the security risks you have identified in your scenario, to whom should they be communicated, and how?

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<th>Table 4-3. Scenario Group Questions. Each group was presented with these questions to answer during and upon completion of their specific scenario.</th>
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(primarily to the final round of presentations during which each group presented their scenarios), most participants learned from other groups as well (Likert score of 2.1). I observed several instances of a group member with a particular area of expertise “teaching” other group members about something relevant to the scenario that group was developing. At several points in each group discussion, a participant asked for clarification about a particular issue relevant to the scenario; if another group member had any insight or knowledge on that issue, she would share with the group. Finally, when asked on the post-exercise survey to identify the “most valuable part of the scenario planning experience,” learning from others emerged in several of the comments (Figure 4-4, Table 4-5).
Decision Making. Scenario planning involves two types of decision making—decisions made during the scenario planning process, and decisions made as a result of (after) the scenario process or exercise. In this stand-alone exercise, results focus on the former, since there were not specified policy or organizational decisions to be made following the scenario exercise. Decision making occurred throughout the scenario discussion and construction. Based on my direct observations, analysis of recordings,
and post-exercise comments from the three group facilitators, all decisions in each group were made by consensus. In this scenario exercise, consensus was achieved easily because the stakes of decisions were relatively low—the event was a stand-alone exercise, with no resulting policy outcomes, financial commitments, or other long-term impacts. Additionally, participants knew their identities were protected, and their names would not be associated with the scenarios they developed. Nonetheless, based on my observation and discussions with the facilitators, and the resultant scenarios developed, each group took the decision making process seriously, never flippantly or with disregard. I observed each of the three group facilitators assist the decision making for the group, but never dominate the decision making process. Though each group had members who were more vocal and participative than others, decision-making was never dominated by a single person.

In each group, I observed that the leadership provided by the facilitator was an important component of the group decision making. Initially, participants looked to their respective facilitators to provide refined guidance and to get the discussion going—a role that each facilitator accomplished successfully. Then facilitators took on the role of keeping the discussion and scenario development moving forward. Facilitator would politely suggest that the group needed to make a decision or wrap up a particular topic of discussion so the scenario could progress. All three facilitators ensured that the group’s designated recorders were capturing the relevant flow of the discussion and mapping out the scenario that the group was developing. Finally, the facilitators ensured that the scenarios drafted by each group were translated into narratives (Appendix B) and submitted to me within a week following the exercise.
Mental Models. Each participant came to the exercise with a pre-existing mental model of the problem, based on their prior knowledge and experiences, the information provided in the read-ahead, and possibly some of the thoughts or ideas presented by the keynote speaker. During the course of the exercise, individuals in each group relied on their individual mental models to construct their scenarios, which, to a certain degree, represent the collective mental model of the group. As the scenarios were developed and discussions happened, participants appeared to adjust their mental models, though I can only base this on my observation. Analysis of the resultant scenarios and observations of interactions and discussions by each of the groups provides some insight into mental models employed by participants. However, a thorough analysis of mental models employed during the exercise was beyond the scope of this research—such an analysis would be very difficult and time consuming, and would involve in-depth pre- and post-exercise interviews with each participant. Glick et al. (2012) offer methods to assess scenario participant mental models, when sufficient time and resources are available.

Half of the participants demonstrated initial discomfort with the scenario process—a reluctance or inability to reveal or express their mental model as it related to the problem at hand\textsuperscript{21}. There appear to be two reasons for this discomfort. First, FSP was new to all participants, and although it represents a relatively simple scenario

\textsuperscript{21} Participants were not explicitly asked to reveal their mental models, but I observed hesitation among half of participants to immediately open up and engage with other group members, sharing their knowledge and ideas. Such discomfort is not uncommon among scenario participants. I have observed this discomfort during previous scenario exercises, and at least two of the scenario experts interviewed for Chapter 3 noted this discomfort. Foresight Scenario Planning deliberately attempts to move experts out of their comfort zone in order to drive participants to open up and rely on one another to incorporate drivers and develop original narratives.
approach, lack of familiarity with a process often breeds discomfort. Second, no single participant possessed expertise with all the drivers, so all participants had to develop scenarios using drivers with which they were not familiar or comfortable discussing. With the assistance of trained facilitators for each group, and a warm up scenario exercise, participants quickly (within an hour) became noticeably more comfortable with the process, and opened up to one another in discussion. I observed participants suspending disbelief quickly and readily, treating their developing storyline as if it was really happening, and I noticed a decrease in the number of questions being asked about the process, as well as an increase in questions, comments, and contributions to the scenario development. Given the limited timeframe for the scenario exercise, the short warm up scenario exercise seemed to be instrumental in preparing the participants, most of whom had no previous experience with scenario planning in general, and none of whom had participated in this particular type of scenario exercise.

The post exercise survey results reveal that the exercise did affect participants’ mental models. All participants agreed that following the exercise they had learned to “think in new ways” (Figure 4-4). A majority of participants strongly agreed or agreed that they would both use information and apply methods they learned during the exercise. Most participants indicated that they understood spatial issues, surprise, and uncertainty better as a result of participating in the exercise. And a majority stated they “will make decisions differently” based on participation in the exercise (Figure 4-4).

Some simple tools and visual aids used during the scenario exercise helped participants express and align their cognitive maps (graphic representations associated with their mental models). Each group had small (8½ x 11 in.) maps of Vietnam and
Southeast Asia. The maps were used for occasional reference and discussion; several participants suggested a larger map, with more detail, would have been helpful to the scenario process, especially for discussing issues at a more local scale. Each group used large pads of paper and sticky notes on which to brainstorm and draft their scenarios. Additionally, two groups used paper to draw out timelines as they built their scenarios (Figures 4-5 and 4-6), which helped them map out events in the scenario as they unfolded over time.

Overall, the scenario planning experience was positive for all participants (Figure 4-4). The value of learning within a small group, sharing knowledge and information with other group members across disciplinary boundaries stands out as one of the most valuable components of the scenario exercise experience. Every participant agreed or strongly agreed that they learned from the fellow small group members (the most positive response in the post-exercise survey, with an average Likert score of 1.3; see Figure 4-4). Additionally, when asked to list the most valuable part of the exercise, seven of the sixteen responses specifically mentioned learning within the small group, making it the most common open-ended ‘most valuable’ response (Table 4-4).

**Scenario Narratives: The Product**

Each of the three scenario groups accomplished the primary task of developing a scenario narrative. What follows is a brief summary of each narrative (all three narratives are available in Appendix B).
Trading Vulnerabilities. Group One’s scenario (Appendix B-1), which they named “Trading Vulnerabilities,” spanned a ten year horizon, starting at present-day (2012). Their spatial focus was “primarily regional, but with global political-economic context an important factor.” The group started their discussion with two drivers: increasing regional energy conflict and increasing fresh water scarcity (Figure 4-5). They focused the source of energy conflict around tightening global oil markets, which leads to increased regional tensions in Southeast Asia over territorial claims and hydrocarbon resources in the South China Sea—the interplay of these two drivers creates a series of cascading effects, as depicted in Figure 4-5. Also, increased oil prices drive Vietnam to expand investment in alternative energy sources, including additional hydropower development on the Mekong River, negotiating new nuclear power agreements with India and the U.S., and cooperation with China on expansion of solar and wind power development. All of these moves serve to increase Vietnam’s energy security. Concurrently, a combination of population growth, rising incomes, and urbanization drive up demand for fresh water, while climate change in the region adversely affects snowmelt upstream in the Himalayas, and seasonal runoff. Hydropower development on the Mekong River and its tributaries also alters streamflow regimes. The sum of these problems decreases water security. In the scenario’s fifth year, a third driver is introduced—a significant spike in world food prices (performance of global food production system). Vietnam’s relative food sufficiency helps it weather the price shocks, but the problems of fresh water scarcity, especially in rural areas, have had a negative effect on smallholder food production. The combination of effects from these drivers adds to national economic slowdown, and rising unrest, especially among the
rural poor and burgeoning youth populations. In year eight of the scenario, participants decided to introduce the fourth driver—a resurgence of the world nuclear industry (nuclear renaissance). This helps to lock in Vietnamese investment in its budding nuclear energy, increasing energy security, and strengthening ties with nuclear partners India and the U.S. By the end of this ten year scenario, Vietnam has traded increased energy security for decreased water security. The country has become more dependent on global food markets, and continues to experience political unrest, especially in rural agricultural areas.
Figure 4-5 Trading Vulnerabilities Scenario. Representation of Group One's scenario. The four scenario drivers are in blue, external drivers or factors in green, and changes or feedbacks in red. The timeline (across the bottom) is approximate—not all changes in the scenario match up precisely with the timeline, but the timing matches up approximately with when the group introduced their four primary drivers.
South China Sea Wave. Group Two created a scenario using four drivers: peak oil, nuclear renaissance/proliferation, increasing scarcity of fresh water, and thinning of Tibetan mountain glaciers (Appendix B-2). The scenario starts in present-day Vietnam, and looks out to 2020 (eight years). The scenario focuses mainly at the national level, but considers both global and local effects. The scenario begins with changes in flow in the Mekong River as a result of glacial melt in upstream glaciers, with negative impacts on arable land and food production, and contributing to an increase in rural to urban migration (Figure 4-6). The problem is exacerbated by the introduction of the second driver, increasing scarcity of fresh water, in the form of sea level rise (leading to salt water intrusion in coastal areas, as well as increased coastal flooding). Slow government response to these problems paves the way for popular uprising from a “youth bulge,” fueled by funding and innovation by a large Vietnamese expatriate population (the Viet kieu). The result is peaceful government reform. Unreliable hydropower, coupled with the third driver, nuclear renaissance and proliferation, push Vietnam to expand its pursuit of nuclear power. The final driver, peak oil, results in increased tensions among countries with territorial claims on South China Sea hydrocarbon resources. To counter China’s bold claims to these resources, Association of Southeast Asian Nations (ASEAN) countries increase cooperation. The combination of increased cooperation among ASEAN countries, increased reform and democratization across the region, and mutually experienced adverse conditions from climate change leads to support for unified support for a new follow-up to the Kyoto protocol. Vietnam capitalizes on access to new climate
change adaptation funding under the protocol to develop its green technology industry, eventually becoming a leading producer of green technology.
Figure 4-6 South China Sea Wave Scenario. Representation of Group Two’s scenario. The four scenario drivers are in blue, external drivers or factors in green, and changes or feedbacks in red. The timeline (across the bottom) is approximate—not all changes in the scenario match up precisely with the timeline, but the timing matches up approximately with when the group introduced their four primary drivers.
**Growth Stalls.** Group Three took a slightly different approach in crafting their scenario. Their four drivers—increasing fresh water scarcity, environmental health and disease, peak oil, and organized transnational crime, played into the scenario they created, which looks at the next eight years (to 2020) in Vietnam. But unlike the first two groups, Group Three did not create a sequential narrative. Instead, the group began by examining each driver individually, looking at possible first- and second-order effects of the driver in Vietnam and Southeast Asia. Then, the group identified plausible interactions among the four clusters of drivers and their effects. Finally, the group spent time identifying the critical uncertainties and possible intervention points. The final narrative that the group created reads less like a storyline than the approach used by the first two groups. Highlights of this groups’ approach include areas where first- and second-order effects of more than one driver intersect or overlap. For example, where increasing fresh water scarcity leads to sanitation problems, this combines with problems with disease to create an additional burden on Vietnam’s public health system. In another example, each of the group’s four drivers contributes to decreased food security. In their scenario, increasing fresh water scarcity reduces water availability for rice production; diseases result in livestock die-off or kills; as a result of peak oil production, pollution from increased oil production in the South China Sea threatens fisheries; and transnational crime includes illegal fishing in the South China Sea, also threatening fisheries.
Figure 4-7 Growth Stalls Scenario. Representation of Group Three’s scenario. The four scenario drivers are in blue, external drivers or factors in green, and changes or feedbacks in red.
Discussion

Overall, the scenario planning exercise was successful. The results helped to answer the dissertation research questions: How does scenario planning deal with issues of multiple spatial levels and surprise in addressing uncertainty associated with complex socio-environmental problems, such as climate change and security? And, how can a better understanding of uncertainty, gained through scenario planning, inform research, strategic planning, and policy on problems associated with climate change and security? All three groups understood their requirement to develop a scenario narrative using four drivers, and each group completed the scenario in the allotted time. With the assistance of group facilitators, the groups followed the guidelines set out in their read-ahead instructions, and in the instructional briefing they received at the beginning of the exercise. Each scenario incorporated four drivers, and addressed the effects of those drivers working at multiple spatial levels. In addition to creating three unique scenarios, group participants departed the exercise feeling that their expectations coming into the exercise had been met—they had learned, networked with other professionals, and departed the exercise with new perspectives and understanding of a complex socio-environmental problem. The results above provide several important points worthy of discussion.
What was the most valuable part of the scenario planning experience?

“Group discussion—bringing different expertise to the table and understandings of complex issues”

“Hearing the diverse views of my group, as they all had a different area of expertise”

“Small group working and discussions”

“Group interaction”

“Interaction with fellow participants”

“The mix of expertise in the group, coupled with the ability of both the group leader and participants having the ability to step outside their expertise, made for great conversation”

“Discussing with a variety of professional backgrounds”

Table 4-4. Post-exercise participant survey comments. Participants were asked, “What was the most valuable part of the scenario planning experience?” Each of the selected responses above focused on the value of small group interaction and dynamics, the most common theme for this open-ended question.

The purpose of this case study was to provide insights into scenario planning processes, and how those processes influence the resultant scenario products. The case study achieved this purpose to some degree, though fell short in certain areas, which will be discussed below. To achieve the purpose of the case study, the scenario exercise was set up to accomplish four goals:

- to test a novel scenario building method (FSP) in order to determine its usefulness in understanding complex, multilevel socio-environmental problems;
- to gauge participant learning during the scenario planning process;
• to assess dialog and engagement in order to determine how FSP facilitates communication among participants and groups;

• to assess participant mental models employed during the scenario planning process in order to understand how participants with different mental models interact during scenario planning process, and how mental models change as a result of the scenario exercise.

The first two goals were achieved during the study; the third goal was attained to some degree, though not as thoroughly as the first two goals. The fourth goal was not attained—an accurate assessment of participant mental models was not achievable with the time and resources available for the exercise. Based on my observations, analysis of the scenarios created by each group, and the post-exercise survey, FSP was useful in helping a diverse group of participants who were not familiar with scenario planning develop a scenario in a limited time period, with limited prior knowledge, that helped them understand a complex, multiscale socio-environmental problem—the exercise clearly attained the first goal. Within a few hours, all three groups, made up of individuals who had never worked together previously, created plausible scenarios that directly addressed problems related to energy or environmental security in Vietnam. Group members worked together, drawing on one another’s knowledge and experiences to understand a complex socio-environmental problem. The exercise also accomplished the second goal. Nearly all participants agreed that they learned from the planning process, from others in their groups, and from other groups during the scenario exercise (Figure 4-4, Table 4-4). Throughout the exercise I observed group members with
expertise in a specific area of discussion, often related to one of the scenario drivers, teaching other group members or answering questions related to their area of expertise.

The third and fourth goals are more difficult to quantify and measure. Dialog and engagement among group members was continuous during the exercise, and occasional between groups. I observed continuous, positive dialog in and among groups as they worked together to develop scenarios. Facilitators kept their groups on topic, and group recorders captured key points, allowing groups to revisit topics, re-map their scenarios, or move forward in the dialog. Participants were engaged with one another, and with the problem they were working to understand—I observed most participants, especially in Groups One and Two, readily suspend disbelief and immerse themselves in the scenario as they created it. Disagreements among group members were frequent, but never emotional or hostile—in every disagreement or debate between or among group members that I observed, members quickly resolve the point, either by concession or by consensus, allowing the conversation to move to the next topic. The fourth and final goal, assessment of mental models and how they may have changed during the exercise, is very challenging, and in hindsight was beyond the scope of the case study. Accomplishing this goal would require in-depth pre- and post-exercise interviews with participants to gauge how their mental models may have changed as a result of the scenario exercise (Chermack 2011). Due to limitations with the sponsoring organizations, I was limited in the amount of time available for the exercise. Nonetheless, results of the post-exercise survey, and my observations of participants, indicate that participants learned and changed the way they think about certain problems or issues they faced in the scenario development. All participants agreed or strongly
agreed that the exercise helped them think in new ways, indicating a shift or change to their mental model (Figure 4-4). The specific geographic and temporal focus of the scenario, and the requirement of individuals to identify and map out specific problems, raised awareness among all participants. And in several unsolicited post-exercise conversations, participants expressed to me how the process of scenario planning, including the conversations with fellow participants during the exercise, helped them think in new ways about some of the complex environmental security problems their group addressed. The relatively simple scenario exercise helped participants understand and communicate uncertainty and complexity (Carpenter 2009), at least among and between groups in the exercise.

The scenario exercise also held three goals for participants:

- create a plausible scenario;
- identify uncertainty associated with their respective scenario; and
- identify possible solutions for (or preventative measures to avoid) such problems (referred to as interventions).

First, each participant group created a plausible scenario—two of the groups created storyline narratives, while the third group structured their scenario and discussion around the interaction of their four drivers, not in narrative form. Groups One and Two initiated their scenario planning by drawing two drivers. Each of these two groups spent considerable time ensuring group members understood the driver, what may have caused or preceded the driver, and then how the two drivers could plausibly interact or affect each other. Both of these groups discussed spatial scale issues—how the drivers interacted at local, state, and regional levels, though discussions of scale were not
methodical. Groups One and Two introduced the subsequent two drivers one at a time. The introduction of each new driver energized discussion. First, groups discussed the new driver, ensuring all group members understood the driver, and allowing any group member with expertise that related to the driver to contribute knowledge or experience to the group. Then the groups focused discussion on how the newly introduced driver might affect or interact with the previous drivers, or the cascading effects that had developed since the introduction of the new driver. Group Three took a different approach, and did not meet the intent of creating a storyline narrative that incorporated all of their variables. In their discussion, they first focused on each of four drivers, and then discussed how those drivers might interact. But their discussion did not follow a timeline, and they did not discuss how their drivers acted or interacted over different spatial levels. Based on my observations, I think more explicit guidance to the facilitator, specifically emphasizing the importance of creating a narrative scenario, would have helped the group focus its discussion. Visual aids, such as a large timeline, and larger maps, would help as well. In all three groups, conversation was very open, with frequent debate about the plausibility of different courses of action. Once groups wrapped up their scenarios, a designated spokesperson presented the outline of their scenario to the other groups. Participants were encouraged to ask questions and challenge the scenario plausibility, which happened several times during the question and answer period, and in at least one case caused a group to rework part of their scenario to improve its plausibility.

All three groups struggled to identify uncertainty associated with their scenario, though each group discussed uncertainty throughout the scenario development process. There are two reasons groups were challenged to identify uncertainty. First, the diverse
group of participants came to the exercise with different conceptions of “uncertainty.” Although uncertainty was discussed in the preliminary instructions, and the facilitators were briefed about identifying and recording areas of uncertainty, the concept of uncertainty was difficult to capture in the scenario narratives. Groups One and Two discussed areas of uncertainty in two way. As the groups introduced drivers while building their scenarios, they discussed how the interactions of drivers creates previously unexpected or unforeseen effects. Also, both groups discussed areas that they would like to have additional information in order to make decisions—primarily in the form of monitoring or measuring future change. None of the groups answered the questions about uncertainty given to the facilitators during preparation for the exercise.

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<th>Scenario</th>
<th>Trading Vulnerabilities</th>
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<th>Growth Stalls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizon</td>
<td>2012 – 2022 (10 yrs)</td>
<td>2012-2020 (8 yrs)</td>
<td>2012-2020 (8 yrs)</td>
</tr>
<tr>
<td>Spatial levels</td>
<td>State (Primary)  Regional  Global</td>
<td>State (Primary)  Regional  Global</td>
<td>State (Primary)  Regional  Global</td>
</tr>
<tr>
<td>addressed?</td>
<td>Limited</td>
<td>Limited</td>
<td>No</td>
</tr>
<tr>
<td>Spatial level</td>
<td>Introduction of drivers</td>
<td>1 and 2 initially (Year 0), 3 at Year 8, 4 at Year 10</td>
<td>Discussed one at a time, then interactions</td>
</tr>
<tr>
<td>interaction</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (though not a storyline)</td>
</tr>
<tr>
<td>addressed?</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Identified</td>
<td>Limited</td>
<td>Limited</td>
<td>Yes</td>
</tr>
<tr>
<td>Surprise?</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Identified</td>
<td>Implied in narrative</td>
<td>Implied in narrative</td>
<td>No</td>
</tr>
<tr>
<td>Interventions?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identified</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncertainty?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-5. Summary of Scenarios.
Second, the groups had very limited time to develop their scenarios (three hours), and although the facilitators knew before and were reminded during the exercise to answer questions about uncertainty, all three groups focused nearly all of their allotted time on the scenario development. One of the three groups (Group Three) noted several possible solutions or interventions for problems they identified during their scenario development, but did not discuss uncertainty related to these interventions. The other two groups spent no time identifying interventions, focusing most of their time on the scenario narrative development. Based on my observations, I think more explicit directions for the facilitators and group members would facilitate more deliberate discussion and identification of uncertainty and possible interventions (Briggs and Briggs 2011).

Although scenario planning explicitly avoids attempts to quantify uncertainty, equipping facilitators and participants with terms to help explain uncertainty would be helpful. For example, the intelligence community uses a continuum of estimative terms to discuss likelihood and confidence (such as “remote,” “very likely,” or “almost certain”) that may help participants explain uncertainty, or communicate uncertainty to decision makers following scenario planning events (Friedman and Zeckhauser 2012). Well trained facilitators could guide the use of discussion about uncertainty. Placing a large visual aid in the group workspace, where the group can list uncertainties and possible interventions as they identify them during discussion, would remind groups of this requirement. Additionally, either adding time to the exercise, or setting aside a specific block of time after completion of the scenarios, would have helped all three groups discuss and capture uncertainty and more clearly articulate interventions.
Finally, the case study set out to answer several questions related to the scenario development process:

- How were the scenarios created?
- What did the participants expect of the process, and were those expectations met?
- Did participants learn during the scenario planning process?
- How do participants address issues of spatial scale, and can they incorporate multiple spatial levels in a simple scenario exercise?
- How do participants deal with surprise?

In brief, the scenarios were created using FSP, with small groups of participants led by a facilitator using their collective experiences and knowledge to create a plausible storyline that incorporated four random drivers from a pre-selected deck of drivers related to the problem of energy and environmental security (including climate change-security) in Vietnam. Groups One and Two followed the FSP process closely, with trained facilitators playing a key role in keeping discussion on topic, and ensuring the groups stayed on time. The scenario narratives these groups created, Trading Vulnerabilities and South China Sea Wave, both present plausible futures for Vietnam. Group Three’s scenario, Growth Stalls, did not follow the FSP process as closely, but still yielded a scenario that identified important uncertainties and areas for possible intervention. As noted previously, groups used discussion, debate, and consensus to weave stories that incorporated their four drivers.

In general, participants expected to learn about environmental security, Vietnam, and the scenario planning process, and these expectations were met (Figure 4-4). Also, participants expected to expand their professional network as they worked with and
developed relationships with others during the workshop, and again, these expectations were met. Although the long-term study of such relation building and networking is beyond the scope of this research, I am aware of several ongoing collaborations among or between participants that grew out of this scenario planning exercise. Participants unanimously agreed that they learned during the scenario planning process, as previously noted. All three groups developed scenarios that focused primarily at the state level (Vietnam). Each group did discuss issues at finer and courser spatial levels, but discussions about interactions of drivers or variables across spatial levels were limited. Although SPT allows significant freedom to examine multilevel spatial issues, facilitators must be trained to foment such discussions, and participants must be prompted to think explicitly about multilevel issues and interactions. More explicit instructions, and more time for discussion and scenario development would help. Finally, two of the three groups introduced some type or types of surprise in their scenarios. In one group (Group One) the introduction of two of their four drivers, at different times during the scenario served as surprises in their narrative (Appendix B-1). At year five in their ten year narrative, a spike in world food prices drives unintended consequences in Vietnam. Following that, resurgence in the global nuclear industry also serves as a type of surprise, changing regional and national energy markets in Southeast Asia and Vietnam. In Group Two, a combination or interaction of drivers created a different type of surprise. Agricultural and economic down turns in Vietnam puts pressure on the government to adapt and modify its current policies and investment incentives. Surprisingly, this draws robust investments from Vietnam’s large expatriate population (Viet kieu) living abroad, and helps drive economic recovery and reform. Both of these groups discussed the
surprises in their scenarios, and my observations confirm that the process of introducing drivers during FSP facilitates thinking about and discussion of surprise—a significant deficiency of more traditional scenario planning methods (Toth 2008). A majority of scenario participants stated that they understood surprise better as a result of the scenario exercise (Figure 4-4).

Conclusions

This chapter has described a one-time scenario planning exercise focused on energy and environmental security in Vietnam. The exercise brought together a diverse group of participants from the academic and policy community, and employed a novel scenario planning method, foresight scenario planning, to develop plausible scenarios. The purpose of the case study conducted for this chapter was to provide insights into scenario planning processes, and how those scenario planning processes influence the resultant scenario products, contributing to a growing body of literature on scenario planning processes (Amer et al. 2013). The purpose was supported by four goals. The first goal was to test a novel scenario building method in order to determine its usefulness in understanding complex, multilevel socio-environmental problems. This goal was achieved, as demonstrated by the three scenarios produced by the participants, by feedback by the participants, and by my observations during the exercise. The second goal was to gauge participant learning during the scenario planning process. This goal was also attained, as demonstrated by my observation of teaching and learning taking place among participants during the exercise, and by the post-exercise survey—
participants unanimously agreed that they learned during the process, especially from
other members of their groups. The third goal was to assess dialog and engagement
among participants. This goal is more difficult to assess and quantify; I observed
continuous, productive dialog among group members during the scenario, and
participants were engaged with one another, and with the problem at hand, though
occasionally had to be brought back on topic by group facilitators, who played a key role
in the scenario planning process. Finally, the fourth goal was to assess participant mental
models employed during the scenario building process. Though mental models are a key
component of scenario planning theory (Chermack 2011), they are very difficult to
assess, and in hindsight, were beyond the scope of this case study. A more in-depth case
study, with more time, resources, and researchers, may be able to assess participant
mental models, and determine if the scenario planning process changed individual
models.

Though this case study was limited in scope, there are key conclusions to be made
about foresight scenario planning and scenario planning theory. First, a relatively simple,
stand-alone scenario exercise is useful to enhance learning among a diverse group of
participants (Alcamo 2008a). Based on survey results and observations, both social and
cognitive learning took place before and during the exercise—facilitated by the read-
ahead material, a keynote address related to the exercise, and during group discussions
throughout the scenario building process. All participants agreed or strongly agreed that
they learned from their small groups during the exercise, and that they learned to think in
new ways as a result of the exercise. All but two participants also agreed or strongly
agreed that they learned from other groups, primarily during the large group presentation
and discussion at the end of the exercise. Second, FSP presents a scenario method that is simple to understand and employ. Third, scenario planning serves as a centripetal force for a small group. In this exercise, small groups of very diverse people sat around a table, focused on a single, very complex problem. With limited knowledge, resources, and time, each group developed plausible future scenarios that helped them understand the problem better, identify plausible surprises, and identify possible solutions or interventions. The face to face setting encouraged cooperation and collaboration. Drawing from diverse viewpoints and areas expertise required group members to rely on one another, especially in subject areas where no single person is an expert. Fourth, more work is necessary in the development of scenario planning theory. Chermack’s SPT provides a useful starting point, but it focuses almost exclusively on scenario planning as a strategy for the business community. As discussed previously, employment of scenarios for understanding complex problems and for strategic planning is gaining ground in both the policy and academic communities—more work needs to be done to develop a robust theory that underpins scenario planning (Swanson and Chermack 2013). Specifically, theory should help explain how and why scenarios can be used to understand or solve complex, multilevel spatial problems, as well as surprise. As noted in Chapter 3, adding scale as a domain of scenario planning theory may strengthen scenario methods, encouraging scenario participants and practitioners to consider scale issues in their scenario planning practices. Finally, more research must be done to assess scenario development processes. With few exceptions (e.g., Dietrich 2013) almost all scholarly work on scenario planning focuses on the results produced (the scenarios themselves)—there is a significant lack of transparency and research on scenario
processes. This case study adds to that very small body of work, but there is much more work to be done in order to test scenario planning theory, and refine scenario planning processes.
Chapter 5 - General Conclusions and Recommendations

Want of foresight, unwillingness to act when action would be simple and effective, lack of clear thinking, confusion of counsel until the emergency comes, until self-preservation strikes its jarring gong - these are the features which constitute the endless repetition of history.

-Winston Churchill, Speech to House of Commons, May 1935

The research conducted for this dissertation has explored the nexus of two bodies of research—scenario planning and environmental security. Scenario planning represents the primary focus of the dissertation, with attention to both scenario planning theory and methodology. Environmental security serves as the subject for the scenarios studied for the research. Within the domain of environmental security, I focused on challenges and opportunities related to climate change-security issues. The dissertation began with an extensive review of two bodies of literature: scenario planning and environmental security (Chapter 2). I reviewed the history of scenario work, the theory that underpins scenario research and practice, recent developments in scenario practice, and examples of environmental and socio-environmental scenario planning. I also reviewed two decades of environmental security literature, and then focused on climate change-security literature. The first phase of original research conducted for the dissertation included an analysis of the Age of Consequences scenario exercise, including in-depth interviews with participants, as well as interviews with scenario practitioners who have conducted environmental security scenario exercises (Chapter 3). For the second phase of original research, I conducted a scenario planning case study in which I planned, executed, and
analyzed a scenario planning exercise focused on energy and environmental security in Vietnam (Chapter 4).

This final chapter summarizes the significant findings and conclusions of the thesis. First, I revisit the purpose and goals of the dissertation, and answer the overarching research questions posed for the dissertation. Second, I summarize the theoretical contributions of the research, and I highlight the significance of the theoretical contributions for the academic and policy communities. Third, I discuss the methodological contributions of the research, and again highlight the relevance of my findings to several fields of study and practice. Fourth, I discuss the shortcomings and limitations of my research. Finally, I propose areas for future research related to scenario planning and climate-security or environmental security challenges and opportunities.

**Purpose, Goals, and Research Questions**

The overall purpose of this dissertation is to understand how scenario planning may be employed more effectively and rigorously to explore and plan in light of complex socio-environmental problems. Two goals support this purpose. First, I advanced a theoretical framework for environmental scenario planning that enables a better understanding of complex, multilevel socio-environmental problems. To accomplish this, I drew on the only published scenario theory—Scenario Planning Theory (Chermack 2005, 2011), established for scenario planning in businesses and organizations, and applicable more broadly. Second, I applied a novel scenario planning method, Foresight Scenario Planning (Briggs and Briggs 2010) to a specific, complex socio-environmental
problem—a problem related to climate change and national security. Specifically, the case study conducted for the second phase of research brought together a diverse group of participants who employed FSP to examine energy and environmental security challenges and opportunities in Vietnam and Southeast Asia over a five to ten year planning horizon. The research examined both the scenario products created during the exercise, and, more significantly, the processes associated with scenario development.

The dissertation sought to answer the following questions:

- How does scenario planning deal with issues of multiple spatial levels and surprise in addressing uncertainty associated with complex socio-environmental problems, such as climate change and security?
- How can a better understanding of uncertainty, gained through scenario planning, inform research, strategic planning, and policy on problems associated with climate change and security?

The findings of the dissertation reveal a straightforward answer to the first question—scenario planning, with few exceptions (e.g., Millennium Ecosystem Assessment 2005, Biggs et al. 2007, Dermawan et al. 2013), does not presently deal with issues of multiple spatial levels and surprise, at least not explicitly, as it has been employed to study complex socio-environmental problems. This finding was identified in the review of the literature, and confirmed in the detailed analysis of the only two published climate change-security scenarios (Schwartz and Randall 2003; Campbell et al. 2007). I attribute this finding to a lack of methodological rigor in scenario planning, which I address below. Additionally, the most widely employed scenario planning method (intuitive logics) tends to keep participants locked into a pair of interacting
drivers, and in doing so, may in some instances hinder the identification of surprise. However, interviews with scenario practitioners, and insights gained in the case study demonstrate the potential for scenario planning to deal more explicitly across spatial levels and help identify surprise. These insights will be reviewed below.

Regarding the second question, the dissertation findings identify three areas that must be addressed in order for scenario planning to improve understanding of uncertainty and then inform research, strategic planning, or policy related to climate change-security. First, the term ‘uncertainty’ must be clearly defined and understood by scenario participants. Again, the review of the literature identified—and my interviews and case study confirmed—significant confusion about what ‘uncertainty’ means, and how it relates to the purpose and outcomes of a scenario exercise. Without a clear understanding of uncertainty, scenario participants either remain confused during the exercise, or spend valuable time during the exercise seeking clarification. In retrospect, I did not emphasize uncertainty enough with the facilitators and participants. Second, scenario planning provides a structured approach to bring together a diverse group of participants, with a wide range of experiences and mental models, to examine a complex problem, work together to identify uncertainty, and then identify possible interventions (or the impact of no policy or intervention). Finally, the dissertation findings confirm that scenario planning offers potential to understand and plan for challenges and opportunities specific to complex socio-environmental problems. Climate change-security issues represent a small subset of socio-environmental problems suitable for employing scenario planning, and to date, there are no published results of climate-change security scenarios. Although only a handful of scenario exercises have been
conducted that address climate change-security (and these, as previously discussed, fell short of transparent, structured scenario planning exercises), interviews conducted in phase one of the research and the phase two case study confirm the potential scenario planning holds in this relevant area of research, strategic planning, and policy.

**Theoretical Contributions**

This dissertation contributes to a very small body of literature that addresses scenario theory. The scenario literature lacks any discussion of the theoretical underpinnings of scenario practice, and presently there is only one attempt to establish a scenario planning theory (Chermack 2005, 2011), which focuses primarily on scenario planning in business organizations. There are no discussions of scenario planning theory for scenarios employed to understand socio-environmental problems. My research confirms that there is an absence of understanding or discussion of scenario planning theory among scenario experts—none of those interviewed for my research were aware of Chermack’s SPT, though all agreed there is a need for theoretical discussion, debate, and framework in the scenario planning community. Chermack’s SPT provides a very useful starting point, but because it focuses almost exclusively on scenario planning as a strategy for the business community, not all of SPT’s six domains apply to climate change-security scenario planning. Four of SPT’s domains clearly apply to socio-environmental scenario planning: dialogue, conversation quality, and engagement; learning; decision making; and mental models. Two of SPT’s domains do not apply in many cases—leadership support, and organization performance and change—though
these domains may apply when scenario planning takes place within a government agency or unit, and is conducted to influence either policy change for the agency’s leadership, or organizational change within that agency.

Based on my research, I propose that *scale* should be included as a domain of any scenario planning discussion or framework. Both inquiry- and policy-driven scenarios must address or include components of scale—temporal, institutional, or spatial (Wilbanks and Kates 1999; Biggs et al. 2007). Some scenarios focus at a single level, others at multiple levels. Analysis of socio-environmental scenarios for this dissertation found components of scale in all scenarios, though scale was rarely addressed explicitly or incorporated methodically, and sometimes there was confusion about what scale meant and how to incorporate scale in scenarios. Adding scale as a domain of scenario planning theory would strengthen scenario methods based on SPT, encouraging scenario participants and practitioners to consider scale issues in their scenario planning practices, incorporate scale in scenario exercises, and look for drivers acting across temporal, institutional, or spatial levels.

Finally, strengthening scenario theory would do much to refine scenario-related terminology. A more robust, widely understood scenario theory would help to provide a common language for scenario planning among practitioners. Common terms and concepts would help practitioners during scenario exercises, facilitate transparency and debate among scenario thinkers and practitioners, and help to steer scenario planning out of the “methodological chaos” that some have attributed to scenario planning.
Methodological Contributions

Scenario planning has evolved in many directions over the past four decades. The most widely employed methods have been developed by the business community (Chermack 2011; Amer et al. 2013), but business scenario exercises lack transparency because they are usually conducted privately, and are almost exclusively focused on capturing the scenario products, not the process of scenario building. Not surprisingly, scenario planning conducted by the business community falls far short of scholarly standards of transparency. Government-led scenarios are becoming more common, and are usually more transparent than those conducted in the business community, but they still lack methodological rigor—the methods and processes used to develop scenarios are often not accessible or included in published reports. Because of the lack of transparency, the scientific community has been critical of scenario planning, and is sometimes reluctant to engage in scenario planning and analysis. Recently, however, the research community has started to create a more robust, transparent body of scenario planning scholarship. This dissertation contributes to that body of scholarship.

The dissertation findings include many key points for scenario methodology. Here I highlight three that I consider the most significant. The first point relates to one of the key findings discussed above in theoretical contributions—in most instances, scenario practitioners and participants benefit by employ precise, common terminology throughout a scenario planning exercise. Important terms such as uncertainty, scale, surprise, and risk should be clearly defined by scenario organizers, and understood by facilitators (and to a lesser degree by participants) before the scenario planning exercise begins. Any
terminology related to the specific scenario planning framework, such as foresight scenario planning, also should be clearly defined and understood by participants. Additionally, if the scenario results are presented or published, common scenario terms must be made clear to the intended audience.

Second, the scenario planning case study demonstrates that foresight scenario planning, a relatively new scenario planning method, offers a simple, effective way to conduct a scenario planning exercise. The method requires minimal up-front instruction by scenario organizers. Group facilitators who have either participated in FSP previously, or have received some training on how to guide groups through FSP, are important for a successful planning exercise. Conducting a short warm up FSP exercise prior to the main scenario exercise familiarizes participants with one another, with the process, and allows for a more smooth exercise overall. The introduction of random scenario drivers (selected from a pre-set deck of drivers) during the exercise facilitates identification and discussion of surprise. The random introduction of drivers also tends to push participants out of their areas of expertise, which in turn encourages group members to rely on and learn from one another to create a narrative—learning among group members from one another was reported by all case study participants. Although FSP is not appropriate for all scenario exercises, it represents a simple, effective scenario planning tool.

Finally, the research conducted for this dissertation identified specific methods to improve transparency in scenario planning. Providing a read-ahead packet to scenario participants prepares them for the exercise, explains important terms, concepts, and techniques that will drive the scenario exercise. A read-ahead document also serves as an
archival record of the preparation for the exercise. Although read-ahead information is helpful in preparing participants, care must be taken to be as unbiased as possible in the information provided. Pre- and post-exercise surveys capture important demographic and other information about participants, including expectations, key learning, and satisfaction with the process, as well as an opportunity to propose recommendations for future scenario events. Finally, event organizers and facilitators can record observations about the scenario development process, which can be summarized and published or archived along with the scenario results.

Limitations of the Research

The research presented in this dissertation was narrowly focused, and care must be taken in extrapolating the results. During the first phase of research, interviews were conducted with a small population of participants in the Age of Consequences scenario exercise—the views expressed by those participants are not necessarily representative of the experiences and opinions of all participants. The case study conducted for the second phase of research involved a unique group of participants addressing a particular problem focusing on energy and environmental security over the next five to ten years in Vietnam. The stakes for the scenario exercise were low—the participants were volunteers, and the exercise was a stand-alone, onetime event. There was no direct outcome affecting policy or strategic planning. Although I observed participants actively engaged in the scenario building process, the aforementioned factors may have influenced the way that participants acted or thought during the event. Finally, climate change-security
challenges and opportunities served as the subject for the scenario planning related to this dissertation. The dissertation includes a review of four decades of environmental security and climate change-security literature, and demonstrates that scenario planning provides a useful method to understand and plan in light of national and international security challenges and opportunities associated with climate change. Although scenarios are not an effective tool for establishing causal links between environmental or climate change and security or conflict, they offer a way to look forward and anticipate challenges, explore policy options, and identify potential surprises—nearly all of the existing research in this growing field of study has focused on the past. Much scholarly research remains to be done in environmental security, and scenarios may be useful in helping to identify and refine areas for future research.

**Recommendations for Future Research**

The findings of this dissertation suggest several areas for future research related to scenario planning and environmental security. First, one of the research goals was to determine how scenarios could incorporate drivers acting across multiple scales or levels. During the scenario planning exercise case study, the groups did not address this goal as thoroughly as anticipated, even when directed to do so by the group facilitators. Multi-scale or multi-level scenarios are challenging to create. Are there existing scenario methods that could be employed to incorporate multiple scales or levels in a single scenario exercise? Would including scale as a domain in scenario planning theory help practitioners consider scale more explicitly while building scenarios?
Second, the dissertation identified only one scenario planning theory. Chermack’s SPT is clearly focused on the business community. While it represents a fine effort to identify and test a theory, it stands alone in the scenario literature. The growing field of scenario planning practice needs debate on scenario theory. Does Chermack’s SPT apply across other sectors and practices? Are there domains, such as scale, that could be included in SPT? Would a more rigorous debate of theory refine the language and practice of scenario planning, thereby helping to clear up the methodological chaos sometimes associated with scenario planning?

Third, the dissertation findings demonstrate that scenario planning is appropriate for policy-related problems, but the results do not fully develop the possibility that scenarios are also appropriate for helping to identify areas of uncertainty that may be useful in shaping or setting research agendas. How can scenario planning identify areas of uncertainty or risk, and then help establish a research agenda focused on that uncertainty or risk? Can scenario exercises combine the inquiry-driven thread with the policy-driven thread, helping to bridge the science-policy divide?

Finally, more research must be done to assess scenario development processes. Almost all scholarly work on scenario planning focuses on the results (the scenarios themselves)—there is a significant lack of transparency and research on scenario processes. The case study conducted for this dissertation adds to that very small body of work, but there is much more work to be done in order to test scenario planning theory, and refine scenario planning processes. Research on scenario planning processes could be retroactive, examining past scenario exercises (as in Chapters 2 and 3), or the research could run concurrently with a scenario planning exercise (as in Chapter 4). Regardless,
results and findings should be shared and published widely in the academic and policy communities.

Scenario planning, the primary focus of the dissertation, represents a method for understanding and planning in light of complex, uncontrollable problems. Challenges and opportunities related to climate change and national security represent an example of a complex, uncontrollable problem—a problem that continues to receive attention and raise concern across the academic and policy communities. By improving the rigor of scenario planning theory, and the transparency of scenario planning methodology, we can ensure that scenario planning remains a useful instrument in our efforts to embrace uncertainty and prepare for the future.
References


Blair, D. C. 2009. *Annual Threat Assessment of the Intelligence Community for the Senate Select Committee on Intelligence*. Washington, D.C.


Appendix A

Appendix A-1: Pre-Exercise Survey

<table>
<thead>
<tr>
<th>1. I have previous experience with scenario planning exercises.</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. I have previous experience with other future planning methods (wargaming, forecasting, etc.).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. I am knowledgeable about contemporary or historical issues in Vietnam.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. I am knowledgeable about contemporary or historical issues in Southeast Asia.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. I am knowledgeable about climate change.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. I am knowledgeable about environmental security.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I am knowledgeable about energy security.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. I expect to learn something about scenario planning today.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. I expect to learn something about Vietnam today.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. In today’s workshop, I expect to learn a new method or practice that I can apply to my job.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. I expect to expand my professional network today.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

What is your highest level of education degree completed (circle one)?
- High School
- 2-yr College
- 4-yr College
- Masters
- Doctoral

What do you consider to be your professional or academic areas of expertise?

Your primary place of employment is a/an (circle all applicable):
- Academic Institution
- Federal Government (non-defense)
- Non-government Organization (i.e., Think Tank, Non-Profit)
- Defense Department
- Other Government (foreign, state, local)
- Private/Corporate Sector
- Other (describe): ____________________________

---

22 Adapted from Chermack (2011).
### Appendix A-2: Post-Exercise Survey

<table>
<thead>
<tr>
<th>Question</th>
<th>Response Options</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. This project was useful for me in my current job position.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. I was motivated to participate in this project.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. The exercise made me think in new ways about complex problems we addressed.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. I learned from my small group members during this exercise.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. I learned from other groups during this exercise.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. I expect that I will use or apply information that I learned in this exercise.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I expect that I will apply methods or practices that I learned during this exercise.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. This exercise improved my understanding of spatial scale issues.</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>9. This exercise improved my understanding of possible ‘surprise’ events.</td>
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<td>10. I have a better understanding of ‘uncertainty’ as a result of this exercise.</td>
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<td>11. I will make decisions differently based on what I learned in this exercise.</td>
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<td>12. I have expanded my professional network as a result of this exercise.</td>
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What was the most valuable part this exercise for you?

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What was the least valuable part of this exercise for you?

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Additional comments are appreciated. Please continue on the back if necessary.

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23 Adapted from Chermack (2011).
Appendix B - Scenario Narratives

Group 1 Scenario: “Trading Vulnerabilities”

Time horizon: ten-year period starting from the present (2012-2022)

Spatial Scale: primarily regional, but with global political-economic context an important factor; considerations at state and local level

Drivers: increasing regional energy conflict; increasing fresh water scarcity; spike in global food prices; nuclear renaissance

The first two drivers for our scenario are “increasing regional energy conflict” and “increasing fresh water scarcity.” During the first few years of the scenario, tightening of supplies in world oil markets combine with growing demand as the world economy begins to rebound, resulting in short-term price spikes in world oil markets and an upward adjustment of medium-term price scenarios. This raises the salience of energy security questions for Vietnam and across the region. In the short term, one consequence is heightened tensions around competing territorial claims in the South China Sea. Three medium-term response strategies are also set in motion: the multilateral development banks increase lending and underwriting for hydropower in the Mekong basin (over Vietnamese opposition); Vietnam and India negotiate (with US support) a new nuclear cooperation accord; and China, in what many read as a direct response, begins a regional initiative to promote alternative energy cooperation in Southeast Asian nations,
capitalizing on its continued emergence as a global leader in solar and wind power. Also, with the growing projected value of the oil resources sitting under the South China Sea, governments begin to think about the possibility of joint ventures as a way to get around stalled territorial claims.

At the same time, there is growing recognition across the region of the vulnerability of freshwater supplies. Growing populations, urbanization, and rising incomes all drive strong demand for water, pitting agricultural uses against urban and industrial growth. Climate change is affecting snowmelt and seasonal runoff at a more rapid pace than midrange models had suggested. Hydropower development exacerbates these effects by altering flow patterns and water availability in several Mekong tributaries. Sporadic episodes of rural unrest around water issues continue in China and begin to crop up in Vietnam. Vietnam continues formally to oppose rapid hydro expansion given its vulnerability as the delta state on the Mekong, but energy considerations trump water concerns and Vietnam quietly begins to sign power-purchasing contracts from newly planned dams in Laos and Thailand. The sum total of these effects is that trade-offs between water for energy and water for rural livelihoods are becoming more starkly defined.

In year five of our ten-year scenario, a third driver kicks in: a significant spike in world food prices, driven by a combination of short-term factors (simultaneous poor harvests in North America, Russia, and Australia) and longer-term trends (land diversion, lower-than-expected returns on genetically modified crops, and the continuing challenges of concentrating investment to expand irrigated farmland globally). Southeast Asia’s relative food sufficiency compared to other world regions, combined with the status of
some countries as net exporters who benefit from strong international prices, enables it to weather this shock in a reasonable fashion. At the same time, however, the effects of combined energy and food price increases slow global economic growth, hurting the export-oriented economies of Vietnam, China, and other countries in the region. These developments also have the effect of easing energy demand, but Vietnam’s commitment to a nuclear strategy proceeds apace given the long-term planning framework in that sector and the strategic character of the international partnerships. The same is true for upstream hydro development in the Mekong basin. Job losses from global recession combine with the aforementioned pressures on rural livelihoods and the increasingly apparent effects of climate change to stimulate occasional flaring of localized unrest across the country.

In year eight of our ten-year scenario, a fourth driver kicks in: resurgence of the world nuclear industry. This is the result of several roughly simultaneous developments: a breakthrough in the United States on the permitting of so-called “inherently safe” next-generation reactor technologies; another flip in Germany’s back-and-forth commitment to nuclear power, as economic weakness derails any plans to transition away from nuclear generation; continued strong demand for nuclear technology in emerging economies, many of which have made policy choices similar to Vietnam’s; and the fading memory of the Fukushima disaster. Vietnam deepens its nuclear partnerships with India and the United States and accelerates its plans for bringing reactors online in the years ahead.

By year ten of the scenario period, we find that Vietnam has essentially traded vulnerability in energy for new vulnerabilities on food and water. The decisive commitment to nuclear, the acceptance of upstream hydropower, and the surprisingly
rapid uptake of renewables have muted tensions over offshore oil and shored up prospects for adequate energy supplies in a growing and urbanizing nation. At the same time, there has been no such strategic and coordinated response on the country’s array of water challenges and climate-adaptation needs. Food production by rural smallholders and localized fisheries in particular have failed to keep pace with rising needs, and Vietnam is increasingly turning to tightening world food markets to fill the gap. Episodic flaring of political unrest continues, particularly in rural areas.
Group 2 Scenario: “South China Sea Wave?”

Time horizon: ten-year period starting from the present (2012-2022)

Spatial Scale: primarily regional, but with global political-economic context an important factor

Drivers: Peak Oil, Nuclear Renaissance and Proliferation, Increasing Scarcity of Fresh Water, and Thinning of Tibetan Mountain Glaciers

Vietnam has seen rapid economic growth since the 1980’s and is increasingly becoming more integrated into the global economy. However, the incredible market-led transformation and the rise of the country’s stature in the region raise serious implications for its energy and environmental security. Our foresight scenario group considered the impact of four drivers on Vietnam’s future. The drivers, 1) Peak Oil; 2) Nuclear Renaissance and Proliferation; 3) Increasing Scarcity of Fresh Water; and 4) Thinning of Tibetan Glacial Mountains are likely to place enormous strains on the Vietnamese government and its resources. They will force Vietnam to rethink its energy and environment policy, as well as to reshape its government structure and its relationships with regional neighbors. As Vietnam inches closer to the global stage, our scenario will see Vietnam addressing these issues with multilateral agreements through regional cooperation.

As climate change continues to accelerate, our group considered the thinning of the Tibetan Mountain Glaciers as the first driver to adversely affect Vietnam’s geography around 2013. The increasing flow rate of water into the Mekong River and Red River...
Delta raises the potential for more flooding. As Vietnam’s agricultural production depends upon these water sources, the loss of arable land will slow Vietnam’s economic growth. Rice growing communities will suffer and food prices will go up. The rural citizenry will likely be displaced and possibly forced to migrate to Vietnam’s neighboring countries or major cities. The lack of infrastructure to mitigate these effects will increase outbreaks of diseases and mortality. At this juncture, government intervention may be weak and ineffective due to its lack of infrastructure, resources, and expertise.

In addition, the flooding and salt-water intrusion from coastal sea-level rise will amplify the severity of reduction in fresh water supply—our second driver. This crisis will exacerbate the problems mentioned (migration, sanitation, and disease outbreaks) and further constrain government’s political control and ability to maintain social order. The Vietnamese government will prove ineffective and slow to respond, thus leaving the populace to take matters into their own hands. Lack of governing capacity may thus result in a popular backlash against the government. Vietnam has a relatively young population that is a consequence of the Vietnam War and this “youth bulge” will be the catalyst for government reform similar in spirit to the Arab Spring. Unlike regimes in the Middle East, the Vietnamese government will seek to positively harness the energy of its young people and look for ways to accommodate their demands. The accommodation strategy is appealing to many overseas Vietnamese, (living in the US, Europe, Australia) known as the Viet kieu, who are increasingly investing in Vietnam. The government considers the Viet kieu as “integral parts of the Vietnamese Nation” and thus they contribute not only financial resources but also institution building expertise. Our group
does not think the government will be overthrown, but more likely pressured into addressing its lack of transparency and accountability.

Vietnam’s dependence on hydropower will slowly prove unreliable as an energy source. Currently, the government is well aware that its growing economy and the potential scenario of flooding impels it to diversify its energy portfolio. Our third driver, nuclear renaissance and proliferation, has the Vietnamese government seeking nuclear energy and renewable energy sources for long-term growth and sustainability. The Vietnamese government will have offers of nuclear assistance from Russian and Japanese-US nuclear companies, but Russia’s strong financial support will trump the offers of others so that ground is broken for two Russian reactors in 2015. We also considered the Fukushima Daiichi incident and how it will affect Vietnam’s nuclear energy policy. While flooding is a major concern, we believe Vietnam will still go ahead with plans on nuclear energy, despite the Japanese catastrophe thanks to Russia’s financial commitment. Our scenario group, however, admittedly did not have significant expertise on this particular issue, but given the plausible energy crisis with oil and the South China Sea, nuclear energy could be considered an attractive alternative energy resource.

Lastly, peak oil will greatly shape Vietnam’s energy policy and its regional relationship in the South China Sea. China’s bold territorial claim to the South China Sea region has upset not only Vietnam, but the Philippines, Malaysia, Taiwan, and Indonesia as well. The high oil prices provide these countries with a significant stake in the anticipated sizeable stock of hydrocarbons located under the seabed. However, the risk of going to war amongst these countries will be mitigated by many of these countries
pursuing multilateral agreements with each other through ASEAN, and perhaps with United States support. We see ASEAN becoming more influential as many of these countries are experiencing significant economic growth and becoming more regionally integrated. The melting of Himalayan glaciers, changes in precipitation, salt-water incursion due to sea-level rise, and other impacts on fresh-water availability resulting from climate change affect many ASEAN countries. Recognizing their common challenges, ASEAN decides on a joint position, pushing for a strong binding follow-up treaty to the Kyoto protocol. This is made easier by a “South China Sea Wave” of democratization affecting countries from Myanmar, to Malaysia, Cambodia, and Vietnam to China. The climate change treaty comes into force in 2020 and allows Vietnam and other ASEAN countries to access sizeable climate change adaptation and mitigation funding. These funds enable Vietnam to diversify its energy supply by investing in energy saving technologies and green technology innovations. Vietnam thus takes a leading position in the production of green energy technology, providing a well-timed boost to Vietnam’s economy after years of slower growth and uncertainty due to the above-mentioned negative climate change effects and tumultuous political situation.

ASEAN will provide a counter balance to China’s economic power, and China will see it in its own interest to cooperate in abiding by the 200 mile economic zone of territorial waters in dispute among the countries. Crafting these international economic agreements will require an expertise that coincidently the Viet kieu may help to supply. We do not see this predicament being fully resolved, but serves as de-escalation in tension for more long-term pursuit of regional cooperation.
Group 3 Scenario: Growth Stalls

Time horizon: ten-year period starting from the present (2012-2022)

Spatial Scale: primarily regional, but with global political-economic context an important factor

Drivers: increasing scarcity of fresh water, environmental health and disease, peak oil, increased trans-national crime

Vietnam is a small coastal country in Southeast Asia that is at a critical juncture in its development. While it is on target to meet many of its MDGs, this progress can be halted or even reversed if the negative impacts of possible events are of a sufficient scale.

In this exercise, we were tasked with examining the ways in which four seemingly disparate drivers affect Vietnam and the ways they interact with each other over a period of ten years. Additionally, we considered the role that Vietnam plays in South East Asia, and to a lesser extent, the world.

We begin by examining the various potential impacts of water scarcity, global organized crime, increased disease, and peak oil on Vietnam. We will then progress to an identification of four keys areas where the impact of these events is concentrated, and the steps that could be taken to address them.

Water Scarcity

Perhaps no resource is more crucial to a country’s well-being than water. It is essential for agriculture, manufacturing, and basic human health. When the amount of
available fresh water is decreased, there are many possible consequences. We have identified the following as likely to occur following a shortage in water:

**Deleterious Impact on health.** A shortage of water will have deleterious effects on the health of the population.

**Agricultural losses, food insecurity.** Because water is crucial for agriculture and livestock, these two industries could suffer as a result of scarcity. Drawn out, food insecurity could occur as a result of decreased food production.

**Strained international relations.** Water scarcity could lead to a competition between Vietnam and neighboring countries for access to water, including the construction of dams. While Vietnam could also cooperate with its neighbors, the relations between the countries may be tense.

**Increased Disease**

The risk of increased disease poses a great risk for Vietnam. Because disease affects overall well-being and productivity, there are numerous consequences that might unfold if the rates of disease were to spike. We have identified major consequences below.

**Effect on health and productivity.** The most immediate concern with an increase in disease will be the effect on the health of the Vietnamese population. Due to the severity of diseases that might occur, the public health system of Vietnam could be heavily burdened. Furthermore, when the health of a population declines, the level of productivity moves in the same direction. This will reduce levels of worker output.
Tourism will decline. Tourism accounts for a significant portion of Vietnam’s GDP. Given that many travel warnings could be issued regarding infectious disease, even a possible quarantine, it is logical to conclude that Vietnam will no longer be seen as a safe destination. When tourism stops, the economy will suffer.

Peak Oil

As with the economies of most countries, Vietnam is highly dependent on oil. Furthermore, the demand for oil is not likely to decrease according to price, at least in the short-term. Peak oil prices could therefore significantly slow the rate of economic growth in a country such as Vietnam.

Transportation. The fact remains that the transportation sector is heavily reliant on oil. For this reason, it may become too costly for ordinary citizens to maintain the current level of mobility.

Manufacturing. Manufacturing is an important sector for Vietnam’s economy, as many goods consumed by developed countries are manufactured in Vietnam. Peak oil may make manufacturing prohibitively expensive, an could act as an incentive for multinational companies to move their operations elsewhere.

Expansion of alternative forms of energy. Peak oil may be a blessing in disguise for Vietnam. Faced with a means of energy that is no longer economically viable, the country may begin to invest in other forms of energy, such as wind, solar and bio-fuels.

Strained relations with other countries
Organized Transnational Crime (OTC)

Assuming that OTC continued on its present trend, it will be a significant problem for Vietnam. We have identified the following consequences of OTC.

*Human trafficking.* Already a problem in South East Asia, human trafficking could pose a serious threat to human security in Vietnam.

*Black market for oil.* A black market for oil could develop and strength, which may further distort prices.

*Government Corruption.* A rise in OTC could lead to increased levels of corruption in government.

Areas of Concern

We have identified four critical areas where the above scenarios will manifest themselves the strongest. They are food security, economic prosperity, health, and international relations. We have identified these four areas because each of the drivers will have an impact on them. For example increased water scarcity will have an effect on not only health, but on international relations as well. Likewise, peak oil could effect both energy production and economic prosperity.

Interventions

The identification of the above critical areas is essential in imagining possible interventions. Good governance must be a top national priority, as it will determine the efficacy of any intervention undertaken. With that in mind, a strengthening of the public health sector, particularly in monitoring activities, will better position the Vietnamese government to respond to a nascent health threat. An investment in alternative energy sources such as wind or solar will help insulate Vietnam against the impact of peak oil.
Both the public and private sectors must find ways to consume water more responsibly, and to reuse it whenever possible. If and when water becomes scarce, Vietnam will then have measures in place to mitigate the effects. Finally, Vietnam must commit itself to the rule of law and diplomacy. It is only through this commitment that the country will be able to meet the challenges of Organized Transnational Crime and competition for resources. Cooperation between Vietnam and its neighbors will be paramount in addressing many of these concerns over the next ten years, and Vietnam must make certain that its voice is heard.
**VITA**

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**PRESENTATIONS**
