PERSPECTIVE

Cultivating Strategic Foresight for Energy and Environmental Security

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Historically, people and their governments have not understood or been prepared for the social, economic, and political instability that can result from energy scarcity or deterioration of the environment. Rapa Nui (Easter Island) is an example from centuries ago where an isolated population irreversibly damaged its finite resources. The cutting of trees to move stone statues had a cascade effect on other resources and led to a dramatic decline in both population and prosperity (Diamond, 2005; Fagan, 2008; Pointing, 1991). More recently, in Darfur, human struggle over access to oil resources, compounded by problems wrought by persistent drought, produced both socioeconomic isolation and regional ethnic disconnection, magnifying a conflict that displaced nearly 2.5 million people (International Crisis Group—Sudan). We contend that disasters such as these can be mitigated or even averted if the complex connections and dependencies of the issues involved can be revealed and if there is a social network to connect isolated areas of expertise and knowledge in order to fully understand and visualize the problems and consequences to leaders and policy makers. This article describes a developing international effort to create a strategic foresight capability addressing the intersection of increasing energy demand and global environmental issues, such as climate change and declining natural resources.

Increasing energy demand and degradation of the environment are intertwined with social, economic, and political elements of society, forming a complex adaptive system (CAS) (Allenby, 2007; Holling, 2001; Tainter, 1990), which has unique and often unpredictable emergent properties (Pilkey and Pilkey-Jarvis, 2007). This global system poses a diverse set of constantly changing threats and risks that surpass and have replaced the security challenges of the Cold War. The new threats to stability come from climate change, competition for energy and resources, relative deprivation, poor governance, epidemics, and changing demographics. The security significance of these threats represents a global challenge, which we believe is largely unaddressed by many governments because traditional approaches of gathering and interpreting intelligence do not provide the social network to connect isolated areas of expertise and knowledge to identify the complex connections and dependencies of issues.

Recognizing this challenge, in 2007 the United States (US) Department of Energy's Office of Intelligence and Counterintelligence established an Energy and Environmental Security Directorate, which initiated several international meetings aimed at developing a new business model better suited to the nontraditional challenges posed by the energy-environment CAS (Glasgow Group, 2007). The resulting international team has taken several steps toward the development of an energy and environmental strategic ecosystem (EESE) to cultivate the connections across traditional boundaries that are necessary to produce strategic foresight. The ecosystem is not intended to replace traditional intelligence activity, but rather to augment it.

In contrast to traditional gathering of intelligence, the EESE will create an international strategic foresight ecosystem where a diverse community of physical and social scientists, engineers, security analysts, and other professionals can connect to initiate ideas and coalesce key concepts from the vast amount of data available about any energy and environmental issue. This is a bottom-up, grassroots approach to cultivating knowledge that can influence both individual awareness and effectiveness, as well as organizational responsiveness and adaptation (Bray, 2007). It provides a space to combine and make sense from knowledge fragments (Winograd & Flores, 1987) and a framework for management, creation, and transfer of knowledge (Alavi & Leidner, 2001; Gold, Malhotra, & Segars, 2001). Wikipedia.org is an example of successful knowledge ecosystem.

By analogy, in a successful biological ecosystem, genes mutate, organisms are selected, and populations evolve (Dawkins, 2006); in a successful economy, business plans are generated, businesses succeed or fail, and a global economy emerges (Beinhocker, 2007). The EESE will also have three phases:

1. A *random phase*, in which individuals contribute observations, ideas, and innovative insights.
2. A *selection and growth phase*, in which individuals engage in open discussion and consider alternative viewpoints; participants examine issues both in depth within a discipline and also across disciplines.
3. An *emergent or organization and amplification phase*, in which "cultivators" span multiple group discussions to develop insights from the two earlier phases into adaptive foresight and enhanced situational understanding products for policy makers.

For the EESE, isolated areas of expertise and knowledge across disciplines will connect in the selection and growth phase. Organization and amplification occur as knowledge, ideas, and insight meld into

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collective analyses that will contain a spectrum of views rather than a misleading single answer or singular perspective. Sense-making and meaningful foresight are emergent properties of the ecosystem, cultivated at the group/collective level. More participants commenting will lead to coarser granularity of the analysis, and failed attempts to disprove an idea will strengthen it (Popper, 2002).

The information generated will enable adaptive foresight and enhanced situational understanding of risks and opportunities. The EESE will be a global international framework for leveling the playing field for all users and contributors and provide a platform for collaborative assessments of common questions and problems. The focus will be on building outcomes, developing scenarios, and experimenting with ideas to provide warning of dangers and alert to opportunities (Davis, 2007; Service Canadien de Renseignements Criminels/Criminal Intelligence Service Canada 2007). The level playing field in this global common area will also encourage people to connect to the EESE, counteracting the danger of disconnectedness noted by Thomas Barnett (2004).

Contributions will be provided, and either supported or not, by a wide variety of participants who typically do not envision themselves as security analysts. The ecosystem process, which may involve reputation or evaluation rankings, can help overcome several typical disadvantages of individual contributors to collective efforts, such as the following:

1. *Individuals are limited in what they know*. An individual typically observes only fragments of phenomena and then develops a theory about the underlying factors that may have caused the events. This can sometimes lead to an illusion of understanding, when an individual actually may not fully understand the phenomena (Taleb, 2007). An ecosystem approach can bring a fuller awareness and collective insight.

2. *All ideas and contributors are not equal*. Memes are the fundamental building blocks or ideas of social systems, functioning similarly to genes in a biological system (Blackmore, 2001). Any meme or idea changes and modifies as it is transmitted, with some gaining an unjustifiable initial advantage or disadvantage (Taleb, 2007). The ecosystem can negate this effect, letting innovative ideas and approaches be heard equally.

3. *Contributors have role specific blinders*. Policy makers strive for the larger picture but are often focused on the "what and how" and not the bigger question of "why" (Barnett, 2004). In contrast, individual contributors tend to be specialists who contribute to the bigger picture. The ecosystem will bring policy makers and analysts into a common forum, leading to the sharing of deeper questions and views across disciplines and improved contextual awareness.

4. *All individual have biases*. As individuals put ideas and events into a narrative, they will likely be selective and impose their own order (Taleb, 2007). The resulting story then changes how both the analyst and reader make sense of subsequent information. This may lead individuals to formulate a cause when the underlying process is not understood and can cause individuals to "herd." The ecosystem can break this cycle by changing the interaction dynamics.

5. *A systems perspective is missing*. Individual analysts and historians tend toward monocausal explanations in a CAS. Although one event is occasionally a tipping point, a systems perspective provides a more complete explanation. In analyzing the various historical explanations for the fall of Rome, Joseph Tainter (1990) notes that no single explanation reveals the whole story and that only an analysis of all individual explanations presents a complete picture. The ecosystem approach encourages a systems approach.

6. *Individuals are influenced by their experience*. Individuals sometimes focus on previous experience, both successful solutions and discarded ideas, when addressing a new problem (Cohen, March, & Olsen, 1972; March, 1991). These legacy thoughts can preclude consideration of new original ideas or of accepting the reality that some events are not explainable with available information. The collective knowledge in the ecosystem has potential to expose and mitigate this problem.

7. *Increasing fragmentation leads to knowledge gaps* (US Government Printing Office, 2003). In the United States, 16 different intelligence agencies are involved in national security, spending over $43 billion each year (US Government Printing Office, 2004), with only 10% devoted to analysis and making sense of collected data. With energy and environmental security, the problems are now global and more complex, entail even more abundant information, and require greater emphasis on analysis. A bottom-up approach can provide a basis for connecting across boundaries, linking fragments of information, and filling knowledge gaps.

8. *Intentional deceit produces flawed analyses*. Contributors or intelligent consumers can intentionally provide incorrect and misleading information in an attempt to influence the system through deception. Self-policing efforts on Wikipedia.org and more formal peer-review processes of academic journals have been successful in using internal participants to review contributions, thereby reducing the opportunity for successful misinformation efforts. The EESE will have a self-policing function.

The numerous complex scientific and social issues associated with energy and environmental security issues pose challenges for policy makers who seek to make evidence-based decisions (Marburger, 2005). We believe that the knowledge ecosystem approach holds great promise for bringing relevant parties into a dynamic and more transparent forum on these global, transboundary issues. The resulting emergent properties of sense-making and strategic foresight have the potential to transform isolated areas of expertise and knowledge into a connected, more complete picture for policy and decision makers. In doing this, the ecosystem will complement traditional national security organizational frameworks with a system that cultivates connections, brings together groups of experts and problem holders, and preserves the richness of diverse views, providing new opportunities on a range of objectives and outcomes.

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