

ACCO

ASSOCIATION OF CLIMATE CHANGE OFFICERS



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Defense, National Security & Climate Change:

Building Resilience and Identifying
Opportunities Related to Water,
Energy and Extreme Events

Workshop Synthesis Report

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About ACCO

The Association of Climate Change Officers is a 501(c)(3) non-profit membership organization for executives and officials worldwide in industry, government, academia and the non-profit community. ACCO's mission is to advance the knowledge and skills of those dedicated to developing and directing climate change strategies in the public and private sectors, and to establish a flexible and robust forum for collaboration between climate change officers. For more information about ACCO, please visit www.accoonline.org.

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Introduction

Since 1900, the global population has increased over fourfold, putting unprecedented strain on our planet's resources and life supporting systems. Humanity's contribution of greenhouse gases (GHGs) to the atmosphere has begun to cause Earth's climate to change, warming hundreds of times faster than it has at any point so far in our planet's history. Awareness of climate change is growing in the defense community, exemplified by the 2010 Quadrennial Defense Review (QDR), which was the first version of the guiding defense document to explicitly consider how climate change might affect the defense mission.

On June 25-26, 2012, over 130 leaders working in the climate and defense nexus gathered in Washington, DC to participate in a workshop titled "Defense, National Security and Climate Change: Building Resilience and Identifying Opportunities Related to Water, Energy and Extreme Events." During those two days, participants shared insights in roundtable sessions and listened to leaders representing a broad range of organizations and perspectives. The workshop aimed to present a variety of perspectives from the defense and associated communities on the national security and defense implications of climate change. By bringing together the leading minds in the field, the workshop sparked important conversations and allowed participants to learn and share insights on the state of climate change work in the defense community.

The purpose of this paper is to distill some of the main themes and ideas derived from the workshop and synthesize what was learned. It is the goal of the paper to not merely summarize the events of the workshop, but to analyze and discuss some of the important ideas that emerged from it.

Climate Change and the Defense Mission

It is the mission of the defense community to protect the nation's people and its interests. Climate change is starting to be acknowledged as being inextricably linked with that mission. Stated directly in the 2010 QDR: "Climate change and energy are two key issues that will play a significant role in shaping the future security environment."ⁱ Led by the QDR and other guidance, the defense community is reacting to climate change by studying its impacts and implementing solutions. Climate change is becoming integrated into the thought processes of the defense community as its effects on the defense mission become better realized and understood. In this section, we explore some of the ways in which speakers described climate change in the context of the defense mission.

ⁱ U.S. Department of Defense. 2010. "Quadrennial Defense Review Report."
<http://www.defense.gov/qdr/QDR%20as%20of%2029JAN10%201600.pdf>

Clear, Mission Driven Incorporation

Climate change activities fit firmly within the framework of the defense mission and are not driven by political or environmental concerns. Many speakers described their organization's views on how climate change might impact their mission, and how the climate change related actions they are taking are fundamentally linked to their desire to improve overall mission effectiveness.

An important starting point for linking climate change and the military mission is understanding that the military views energy as crucial to completing its mission. Michael Aimone, Director of Business Enterprise Integration at the Office of the Deputy Under Secretary of Defense (I&E) for the U.S. Department of Defense (DOD), explained how energy security and the cost of energy are driving planning towards increased renewable energy and greater energy efficiency. The ability to maintain power 24/7 even in the most challenging environments can be essential to the military mission. Being able to utilize various energy sources such as wind and solar and connecting them to a microgrid enables units and bases to continue to execute their mission even when external energy supplies are limited.

The huge fuel lines necessary to supply the military with its operational energy also make renewable energy and energy efficiency important for increasing mission effectiveness. Sharon E. Burke, Assistant Secretary of Defense for Operational Energy Plans and Programs at DOD, discussed the connection between energy issues and soldier mortality, noting that many lives are lost protecting vulnerable fuel convoys that frequently come under attack in conflict areas such as Afghanistan. Renewable energy and energy efficiency can literally save soldiers' lives by decreasing the frequency with which they must risk themselves protecting fuel convoys.

Water security is also essential to military operations, and decisions to decrease water use are made with that in mind. Addison (Tad) Davis, IV, Command Executive Officer and Director of Services and Infrastructure Core Enterprise for the U.S. Army Reserve, and William Goran, Director of Center for the Advancement of Sustainability Innovations for the U.S. Army Corps of Engineers, noted bases often rely on water sources from the outside to provide for their water needs. These sources are not under full control of an installation and could be compromised by climate change effects such as drought or saltwater intrusion into aquifers. A base cannot operate and conduct its mission without sufficient potable water; therefore efforts to decrease water consumption and increase recycling provide the military with resiliency against water security threats. Although water conservation efforts are beneficial from an environmental standpoint, first and foremost water security efforts are undertaken to help personnel complete their defense mission.

Many speakers emphasized that environmental benefits are not the motivation for pursuing climate change related efforts. Tom Hicks, Deputy Assistant Secretary of Energy for the U.S. Navy, opened his presentation with a series of images emphatically conveying that the energy and climate change actions of the Navy are undertaken because of their impact on the mission and that the perception of the military as tree huggers "couldn't be further from the truth." He

went on to describe some of the impressive, completely mission driven energy projects being undertaken by the Navy, including large scale renewable energy installations.

The military does not spend time or money on a climate change related infrastructure or research project if it will not better its ability to defend the nation. This way of thinking enables climate change related decisions to be evaluated on the single, clear criteria of whether they will improve mission effectiveness or not. By incorporating climate change decision making into the already well understood context of mission effectiveness, it eliminates some of the vagueness that can surround climate change efforts when viewed only as environmentally beneficial, allowing quicker and more decisive action to be taken on climate change issues.

High Level Support

There is an increasing level of support within DOD and other federal agencies to build resilience against climate change, including support from the highest levels. By having the support of top military leadership to promote climate change initiatives, progress is able to be made quickly and efficiently within the defense community.

At the workshop, it was shown that multiple top defense leaders have acknowledged that climate change is real and are taking action on it. Davis stated that “this is real for us” and “we have an opportunity here collectively” to improve the situation. Burke believes that military leadership is fully behind decreasing energy usage to increase mission effectiveness. She quoted Afghanistan commander General John R. Allen, who connected energy initiatives and mission effectiveness by saying “operational energy equates exactly to operational capacity.” Even Defense Secretary Leon Panetta is involved in the issue, as he spoke on DOD’s views on climate change at a recent event. Because defense organizations operate through strict chain of command, having strong top-down support from military leadership on climate change is critical for taking effective action.

Increasing Energy Supply and Decreasing Demand

The military is the largest consumer of energy in the United States. By improving the energy efficiency of military installations as well as increasing the use of renewable energy, DOD is able to increase its energy security and resilience. To reduce the amount of energy needed from outside sources, the defense community has made great strides in building and upgrading physical infrastructure to increase energy supply and reduce demand.

Davis described the new goal for some army bases to have Net-Zero energy use, in other words producing the same amount of energy that they use. Aimone elaborated that the two main components to this goal are investing in renewable energy sources and reducing energy demand. Net-Zero energy bases will have greater energy security and resiliency to changes in the surrounding energy environment. To increase supply, DOD’s goal for renewable energy is 3GW by 2025, 1GW for each branch. Hicks listed some activities such as the installation of 20,000 smart meters and LEED certified buildings which the Navy has initiated to reduce energy

consumption. The Navy has also established a longer term goal of having half of their energy supply coming from alternative energies by 2020.

Energy is not the only resource for which the military is working to reduce consumption. Perhaps even a greater threat is water security. Goran discussed Fort Bliss, a large, growing base on the Texas/Mexico border with a limited water supply that climate change is projected to further decrease. Fort Bliss has announced an Army target to reach Net-Zero energy, water and waste by 2020, which will help enable it to keep operating effectively even as water conditions worsen.

The truth of the matter is that the military's huge energy and water requirements can present a risk to the defense mission. A number of actions have been taken to increase our security and resilience for both of these resources. Burke presented the solution as a combination of increasing energy and water efficiency, increasing use of renewable energy, and decreasing demand to help reduce energy requirements and decrease risk to the mission.

Leveraging Best Science in Decision Making

A major component of incorporating climate change thinking in the military is using the best science available to make decisions about how to prioritize our actions. While future impacts of climate change are uncertain, the military is used to taking action on threats that are not 100 percent certain to occur. There is a wealth of information and research on climate change, and the defense community is continuing to utilize the best science available to further its own effectiveness.

In order to deal with the localized impacts of climate change, science needs to be developed on a local level. Kim Toufectis, Master Planning Lead for the U.S. National Aeronautics and Space Administration (NASA), explained how NASA uses regionally and locally specific climate change projections at adaptation workshops to help residents understand what climate change will mean for their community and help them plan resilience measures. NASA provides take home materials to workshop participants succinctly summarizing localized climate science. Telling people how climate change could affect their own home can be a very powerful use of science.

By using projections of future climate change impacts, science can be used to prioritize adaptation measures. Many of the Navy's installations are, by necessity, built at sea level, making them vulnerable to sea level change. Courtney St. John, Climate Change Affairs Officer for the U.S. Navy's Task Force Climate Change, emphasized that the facilities that are most vulnerable can be identified and adaptation planning can be prioritized based upon vulnerability assessments. Mark Kodack, Program Manager at the Office of the Assistant Secretary, Energy and Sustainability for the U.S. Army, urged workshop participants to use climate forecasting to identify which suppliers might be most vulnerable to water shortages. When planning for adaptation, the defense community doesn't need 100 percent certainty on issues to begin initiating action.

DOD's Role as a Testbed

DOD has a history of serving as a developmental testbed for important technologies that eventually become commercially available to the public such as GPS or integrated circuits. DOD is unique in its strong ability to give emerging water and energy technologies the resources necessary to progress from promising concepts to commercially viable solutions.

The defense community is well positioned to serve as a testbed for sustainable technology due to its strong, mission driven interest in water and energy security and the large variety of physical infrastructure it possesses. DOD's built infrastructure includes almost every type of building conceivable, situated in every corner of the United States. Each installation has the ability to serve as a laboratory for a particular technology, allowing many to be tested at once. Dorothy Robyn, Deputy Under Secretary of Defense for Installations and Environment at DOD, noted the size of DOD enables it to take risks, as the cost of developing any given technology is relatively small compared to the potential benefits of its successful application across the entire defense infrastructure.

Because of its size, the defense community is also able to help make new technologies widely and commercially available. Aimone described how DOD helped previously emerging technologies such as GPS and jet engines come to commercial viability by serving as an early adopter and market creator. DOD by itself can create substantial demand for a technology, creating a market for a product. Also, by serving as an early adopter, DOD does the operational testing of technology, giving later adopters confidence that the technology is trustworthy and effective.

Unfortunately, even DOD does not have the resources to serve as a testbed for all of the promising technologies available. Robyn lamented the fact that DOD programs are only able to test a small fraction, around 5 percent, of potential emerging technologies that submit applications. However, these limitations have not noticeably diminished the great success that DOD has had in bringing emerging energy and water technologies to market. Some of the biggest technological breakthroughs of the past century, including the internet, have come to be as a result of defense research and testing. As demand for efficiency technologies and renewable energy continues to grow as climate change impacts are felt, the technologies that emerge from DOD will be essential in helping both the defense community and general public deal with climate change.

Climate Change and the Organizational Structure

As many of the speakers made it clear that climate change is being considered in the defense mission, it is important to study how it will fit within existing organizational frameworks. Climate change is both a wide reaching and relatively new issue, so defense entities are working now to understand how climate change should be dealt with within their own organization. Speakers expressed that climate change issues pop up everywhere and there is not a standardized way of dealing with them. Described in this section are some of the ways climate

change and climate change planning are being integrated into existing organizational structures.

Climate Change Incorporated into Planning at Many Levels

The defense community has recognized that in order to make climate change initiatives successful, they must be incorporated into planning at both operational and strategic levels. The incorporation of climate change into planning at multiple organizational levels was evident in the wide scale of climate change issues presented by speakers, with some addressing single renewable energy installations and others studying such issues as the global, strategic consequences of water shortages.

On the operational level, speakers described some of the ways they are incorporating adaptation measures and building resilience for bases and other facilities. Keynote speakers Burke and Davis explained the efforts that DOD and Army Reserve were taking to increase their resiliency to water and energy deficits. Programs such as Net-Zero bases and microgrids enable military operations and facilities to be better prepared for challenging water and energy environments by decreasing their dependence on outside inputs. Toufectis spoke on efforts to incorporate resiliency planning into facilities management by hosting facility specific workshops utilizing localized climate projections.

Other speakers on climate change planning took a more strategic view. Major General Richard Engel (ret.), Director of Climate Change and State Stability Program for the National Intelligence Council, presented on their Global Water Security project. Examining water projections up to 2040, the report found that water demand was likely to exceed supply, creating multiple national security threats by destabilizing nations, impacting agriculture and economy, and creating the potential for water conflict. Kevin Watson, Manager of Life Cycle Logistics and Supply Chain Management at NASA, also saw the global strategic potential of climate change in coming decades. His research described the potential of climate change to create more frequent and severe natural disasters as something that could delegitimize governments that did not move swiftly enough to restore basic services for their citizens. Incorporation of strategic research such as this helps defense leaders better understand the geopolitical ramifications of climate change.

Integration vs. Centralization

While all of the speakers represented organizations that were actively planning for climate change, where exactly that planning was occurring within the organizations was not consistent. Climate change is both a risk multiplier that can affect many different areas of an organization and an issue to consider on its own. Therefore, climate change can either be integrated into separate offices which it might impact, or be centralized into one office specializing in climate change issues.

Speakers Toufectis and Richard Kidd, Deputy Assistant Secretary of Energy and Sustainability for the U.S. Army, argued for the effectiveness of integration of climate change thinking into the

very culture of an organization. Toufectis envisioned a future where climate change resilience was a fully integrated aspect of design, like ergonomics, and would be considered almost unconsciously when planning a facility. Kidd, who works to incorporate climate change into the Army, described the importance of making the issue part of the culture. Integration into the defense culture is already being seen as sustainability is now a consideration in the performance appraisal process for base commanders.

Robyn presented a different perspective, sharing the great success her organization achieved by setting up a single office to handle all conflicts between renewable energy projects and mission effectiveness. Common problems such as wind turbines interfering with radar were all funneled into one office which was trained and specialized to deal with those issues efficiently. Centralization of climate change was evident in the titles of speakers and participants as well, as many participants were climate change or energy specialists within their organization.

However, there is no need to view integration and specialization of climate change as mutually exclusive. Both provide useful advantages for dealing with climate change issues and should be utilized in some form. Climate change offices can be the necessary leaders on climate change in organizations that are still considering climate change throughout.

Sharing Information Across Agencies and Sectors

Creating a space to share information and resources across agencies and sectors can allow groups to learn from each other's experiences and avoid replication of unsuccessful projects. Events like the workshop give those in the field a chance to hear about what others are doing and create opportunities for collaboration. The workshop highlighted some of the existing ways information is being shared and the areas where people wanted greater collaboration.

Robyn attested to the abundant coordination between DOD and other agencies on renewable energy development projects. She described the Strategic Environmental Research and Development Program (SERDP) which addresses DOD's environmental issues, and is co-managed with the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA).ⁱⁱ All three agencies are involved in developing the research agenda and managing the resulting projects. Other speakers concurred that within the federal family, climate change action processes are being shared.

Many non-governmental representatives at the workshop were curious about best practices in public-private partnerships (PPP) on climate change. Kidd, Hicks, and Louis Hutchinson, Vice President of Public Sector at Constellation, fielded questions on this issue and presented a few key pieces of advice. One best practice mentioned was to learn how the federal system operates and learn how to work within that system. Another piece of advice was to try and understand the perspective of financiers, and what is attractive to them. Finally, expectation management is important. Just having a project that creates jobs is not sufficient to walk in and

ⁱⁱ U.S. Department of Defense. 2012. "About SERDP."
<http://www.serdp-estcp.org/About-SERDP-and-ESTCP/About-SERDP>

win a contract. The speakers stressed that it is important to remember working with the federal government is different than working in the private sector, and what is effective in the private sector may not be with federal entities. Information sharing across agencies and sectors can lead to more innovation in addressing climate change. Only when we are working together will we make the most of available resources and produce the best body of knowledge in combating the impacts of climate change.

Climate Change as a Risk Multiplier

The greatest potential for harm from climate change may come from its ability to make bad situations worse. It can act as a risk multiplier for almost any situation, taking a potential problem and increasing its risk and severity. Around the globe there are already areas that experience water shortage, lack food security, face extreme weather, etc. Climate change will exacerbate these problems as well as create additional challenges. This risk multiplying aspect makes climate change effects challenging to deal with, as you must be prepared for a wide variety of problems to arise.

Resource Depletion

Climate change has the ability to affect many resources essential to human civilization. Areas facing issues with water, energy, available land or economic growth have the potential to see the issues magnified by climate change. Also, because many of our most important resources are connected, problems with one resource may quickly lead to problems in other areas.

Water is really the key resource that climate change will affect, and through water climate change is able to affect other resources as well. Engel shared his research on some of the strategic consequences that climate change will have on water. His research shows that climate change is likely to cause water shortages in many areas of the world. Changing precipitation and snowmelt patterns will cause nations to be unable to support their current water consumption rates, especially for agriculture. One solution proposed by Engel and his team is “virtual water” trade, where nations with plentiful water trade water intensive products to water poor nations. For example, it takes 15,500 m³ of water to produce one ton of beef, so water poor nations could import beef from abroad and save their own water for other uses.ⁱⁱⁱ

Michael Hightower, Water for Energy Project Lead at Sandia National Laboratories, spoke on the relationship between water and energy, explaining that water and energy are very highly dependent on each other. It takes large amounts of water to run the turbines that produce most of our energy and it takes large amounts of energy to produce and distribute clean water. This relationship can pose some serious challenges when finding climate change solutions. Jonathan Pershing, Deputy Special Envoy for Climate Change for the U.S. Department of State (DOS), described the water challenges being faced by Peru as the Andean glaciers which

ⁱⁱⁱ Office of the Direction of National Intelligence, National Intelligence Council. 2012. “Global Water Security.” http://www.dni.gov/nic/ICA_Global%20Water%20Security.pdf

provide much of the nation's water are projected to disappear due to climate change. One of the solutions proposed is the development of massive desalination plants on the coast, which unfortunately may require such huge amounts of energy as to make them unfeasible.

Climate change can also affect our ability to use land. Hightower's presentation showed that many of our aquifers today are being threatened by either drought or saltwater intrusion. Without these water sources, it is impossible to do agriculture in many of the places we currently do. Sea level rise also has the ability to affect land by simply inundating coastal areas. Toufexis and St. John described some of the planning efforts their organizations are taking to plan for sea level rise at their coastal installations. St. John explained that higher sea levels will allow storm surges and storms to do more damage by affecting the frequency and duration of flooding, even if sea levels do not completely submerge an area.

It is the ability of climate change to affect many things important to human civilization that makes it an important consideration of the defense community. Because many of our most important resources are connected, any region with one vulnerable resource may see problems spilling into other resources. Using either too much water (sea level rise and extreme weather) or too little (drought), climate change can create issues for many important resources.

Instability

Climate change has the ability to threaten human interests through effects such as droughts, floods, and extreme storms. Destructive events will make it difficult for people in affected areas to find the resources necessary to survive. If governments are unable to meet the most basic needs of their people after a destructive event, it may delegitimize the government in the eyes of the people and may lead to an unstable nation-state. Additionally, large scale migrations from unstable nation-states can spread to instability to their neighbors, creating conflict or putting additional stress on already strained resources. Davis spoke to how climate change will impact the training activities of the military. Due to the role of climate change as an instability agent, the Army Reserve must train and be prepared to respond to both traditional threats and climate change created instability and humanitarian situations.

Climate change is projected to increase the prevalence of extreme weather events around the globe, putting stress on water supplies and creating the potential for conflict between nations. Engel discussed research concerning water issues, stating that although there is not immediate concern for water conflict, it could certainly arise in decades to come if we continue on our current track. Neighbors that once peacefully shared a water supply may be driven to conflict if the supply is no longer sufficient for the water needs of both nations. There will certainly be places in the world that will be hard hit by climate change, and how well those places adapt and find solutions will determine the potential for climate change conflict.

Increased Humanitarian Aid

While the role of climate change as a risk multiplier will present many military challenges, it will also create increased need for humanitarian aid from the defense community. Speakers such as

Burke and Rebecca Ranich, Principal of Energy and Resource Management at Deloitte Consulting, pointed out that the defense community plays a huge role in international humanitarian aid, often acting as an early responder at disaster sites. As extreme weather events increase in frequency and severity, the defense community will be forced to expend more resources responding to more destructive and more frequent disasters.

Further compounding the difficulty of responding to climate change induced conflicts and disasters will be the potential for diminished disaster site resources for our military personnel. Disaster areas will be hard hit by climate change impacts, and likely will be without sufficient water or energy. Given that the water and energy are essential to defense missions, the current strategy of increasing water and energy sustainability will be important in enabling the defense community to operate effectively in climate change humanitarian crisis areas.

Developing a Systems Perspective

Systems thinking, a way of understanding how things affect one another within a larger whole, is a useful tool for getting a more complete perspective on climate change threats. Many of the presenters used elements of systems thinking to find connections and context for the climate change issue they studied. Defining the boundaries of your system is also crucial, as you must decide where to focus time, energy, and resources. Presenters illustrated ways to use systems perspective to expand your scope to consider additional resources, longer time periods, larger physical areas, and more of your supply chain.

Resources Scope

Climate change action can sometimes be reduced to carbon dioxide emission control, due to CO₂'s role as the most abundant anthropogenic GHG. However, other equally important parts of the system such as water, land use, food production and economic cost must be considered at the same time to truly get accurate assessments of actions.

Kaveh Madani, Assistant Professor in the Department of Civil, Environmental, & Construction Engineering at the University of Central Florida, presented his work on evaluating energy technologies based on more criteria than their cost and GHG emissions. The model he created quantified the impacts of energy technologies on land use, water use and economic cost as well as their GHG emissions. Ranking various technologies, he found that some technologies that are conventionally thought of as environmentally friendly, such as biofuels, are actually worse than fossil fuel when you consider all four criteria. Some technologies may produce environmental benefits for one resource, but have an enormous negative environmental impact on another. Madani best exemplified the issue facing those seeking climate change solutions when he said “we need to design systems that do not create new problems.”

Paul Faeth, Senior Fellow at CNA, built on Madani's ideas, providing examples of solutions with cascading unintended consequences. Although there are GHG emission advantages for ethanol,

it has a very large water footprint compared to other fuels. Additionally, the massive amount of corn shifted to ethanol production has reduced the supply of corn available as food and increased its price, even as overall corn production has been increasing. Ethanol creates a carbon emission benefit, but it simultaneously creates water problems, increases the cost of food, and causes more land to be degraded by intensive agriculture. Conversely, Faeth described solutions that can have unintended positive consequences. When strong drought struck Texas in 2011, those areas that relied on wind energy experienced less power loss because wind turbines, unlike combustion power plants, generate electricity independent of water availability.

Climate change can affect land, water, energy, economy, health, and almost any activity that humans care about. In doing so, it can remind us that many of our own actions also have the potential to affect a wide variety of things as well. Even as we come up with a solution that solves one problem, we may unintentionally create another. A systems perspective must be developed to better evaluate and understand the trade-offs you are making with a given action.

Time Scope

The time scales associated with climate change may be one of the most challenging aspects to planning solutions and communicating risks. It can be hard to plan for problems that will take effect after today's leaders have retired or passed away. The modeling approaches used by some of the speakers can be useful for considering the implications of climate change on a broader time scale and implementing long term solutions.

Risk managers in the defense community are beginning to look at issues on a broader time scale. Goran described efforts to model water supplies for installations to determine which ones might be vulnerable 30 years in the future. Using these projections can allow vulnerable installations to start implementing efficiency measures now, so they are prepared for times when water resources are more limited. St. John presented a model incorporating sea level rise that the researchers at the Naval Academy are developing to predict future flooding frequency at locations around the continental United States.

The workshop's final speaker, John Englander, author and consultant on oceans and climate change, helped put some perspective on the scope of time we are considering when dealing with climate change and sea level rise. While almost all of the prior presentations used the scope of years or decades, Englander illustrated some of the huge consequences from sea level rise we can expect to see in hundreds or thousands of years. Can we begin to plan for most of our coastal cities being underwater, or is planning on that scale simply too daunting, unfeasible, or uncertain?

Physical Scope

Often, essential resources such as water and energy do not come from within defense installations and instead are generated offsite. This can create a risk for defense installations if the resources that are necessary for the installation to function are not entirely within the

installation's control. Risk managers and installation commanders must include surrounding communities in their planning considerations, as these communities often provide key resources such as energy, water, and transportation.

Communities and regional organizations have resources and knowledge that are essential to the defense mission. Davis provided an example of an army base that was having water supply issues during a drought. After a frantic search it was realized that output from the reservoir 15 miles upstream had been shut off. The lack of communication between the base and the community created a problem that could have been avoided if information was being shared between the two. Bases cannot operate as islands within their surrounding areas because often their resources, such as water and energy, come from the outside community.

Yet, for some communities, addressing climate change can be a new and scary issue. Many communities recognize that the issue must be dealt with, but they don't know where to start or they lack the necessary resources. The defense community must use its advanced knowledge and resources to lead on this issue as it has both an obligation and need to work with the local community. Sharing resources and knowledge between defense installations and surrounding communities allows both to become more resilient to climate change impacts.

Risk in the Supply Chain

Defense organizations have extensive supply chains with thousands of suppliers spread across the world. These supply chains are essential to the functioning of the defense community, but could be vulnerable to climate change. Several speakers highlighted the expansive, systems-based thinking they are using to plan for risk in the supply chain.

Nancy Gillis, Director of Federal Supply Chain Emissions and Chair of Section 13 Interagency Working Group for the U.S. General Services Administration (GSA), urged participants to consider GHG emissions in their supply chain. GHGs can be a good proxy for how energy efficient a supplier is, and how much risk they face from climate change disruptions. Suppliers that are less energy efficient will be more likely to face service disruptions due to climate change. They also cost money to those further up the supply chain by passing on the costs of their inefficient energy use.

Water, as well as energy, can create risks in the supply chain. Kodack spoke to risks in the supply chain from water, noting that often a final product is not produced if anyone of its components further down the supply chain fails. Given that water is needed for most manufacturing processes, it is important to investigate which suppliers are in areas that might face substantial water shortages in the future due to climate change.

Further expanding on supply chain risk management, Watson looked at what role climate change might play in creating instability in the handful of nations that provide almost all of the materials essential for our aerospace alloys. Changes in temperature and precipitation due to climate change can create food and water shortages which destabilize and delegitimize governments and create conflict. Conflicts and instability can have impacts on the price of

minerals, as Watson showed that prices for Cobalt increased 380 percent from 1977-1979 due to conflict in Congo. Considering that 95 percent of known reserves of the essential element Chromium are found in only two nations, South Africa and Kazakhstan, it is essential that NASA and other aerospace defense entities take actions to mitigate risk of climate change caused instability in these and other key mineral producing nations.

Speakers Kodack and Watson raised questions on the scope of the supply chain you are considering. Their presentations illustrated some of the advantages and the necessity of considering your supply chain thoroughly when planning for climate change. However, you can evaluate risk in supply chains almost infinitely, considering every single supplier and nation and their vulnerability to every single climate change threat. Due to finite resources, you must at some point limit what you are studying and evaluating, and the question of where to focus your resources must be considered.

Conclusion

From the exchange of information that occurred at this workshop, participants gained an appreciation of the state of climate change action in the defense community and a clearer understanding of what needs to be done going forward. One big takeaway is that the defense community has become a leader in implementing climate change related projects and planning for climate change risks. The key to enabling this is that leaders in the defense community have consistently utilized the best science in decision making, and the best science today is clearly stating that climate change is real and could pose a threat to national security interests. Acknowledging the existence and potential threat of climate change has allowed the defense community to aggressively pursue energy and water solutions, both of which serve first and foremost to increase mission effectiveness. Acknowledging climate change has also caused the defense community to plan extensively for its impacts, even those lacking absolute certainty. It is clear that the defense community both acknowledges climate change and has the ability to act quickly and decisively to combat it.

Scott Stone, Director of Global Environmental Initiatives at Sierra Nevada Corporation, discussed the Einstein quote “If I had an hour to solve a problem I'd spend 55 minutes thinking about the problem and 5 minutes thinking about solutions.” It will be important for the defense community to continue to think strategically about climate change issues to ensure they are addressing the most important problems. Climate change will continue to pose threats to national security in the future, threats that are only projected to increase. Senator Bernie Sanders, U.S. Senator for Vermont, succinctly summarized the importance of facing this global predicament saying “we are planning for the future of our planet.” The defense community must continue its leadership in the field, staying at the cutting edge of climate change thinking and action.

One of the great benefits of a workshop such as this one is that it allows participants to share and disseminate the tools and ways of thinking that are effective for dealing with climate change. For a complex and global issue such as climate change, it will be important to develop

and utilize strategies such as systems thinking, incorporation of resilience in design, long term modeling and strategic planning. The sharing of information will be important for enabling those working in climate change and defense to make sure they are staying abreast of the best practices necessary to do their important job. Climate change will inevitably create new challenges, and it will be important for our tools and understanding to advance as well.

Appendix: Roundtable Sessions

Infrastructure

Overcoming Barriers to Public-Private Partnership and Third Party Financing

This roundtable was centered around three main questions related to overcoming barriers to PPP and third party financing. The first question looked at limits of what can be done and what cannot be done? The second question evaluated why PPP has not been very successful so far? The third question asked what are some strategies for mitigating risk in PPP? By discussing these questions in reference to the theme, potential solutions and next steps emerge.

Need for Education

Based on the experience with DOD and NASA, it was pointed out that many contract negotiations and implementations fail because contracting officers are not well trained. Often, they do not understand the PPP tools and are not willing to take risks. Issues came up when contracting officers did not understand involvement of schools, municipalities, and long term implications. A key barrier is the lack of knowledge and education. As a result, there is a need to educate them on various performance contracts.

Tactical vs. Strategic

Government views these initiatives as tactical not strategic. Without long term consideration of PPP, from the contract point of view it is either anemic and contract structure is not utilized for the goal, or not flexible enough for expanding to what could be done. There is a need to step back with contracting officers and with sustainability individuals to find creative and collaborative ways to put together procurements that handle a myriad of contract types to satisfy tactical as well as strategic requirements. This would help utilities wanting to finance as well as use third party financing. As far as the deals go, the law governs the limits of the deal. But there is an opportunity for private enterprise to improve how they deal with the federal government. How do you get a contracting officer to evaluate the deal correctly? There is a need to keep in mind that the government views it as transactional, not a long term strategic program.

Legal Perspective

From a legal standpoint, reflecting on underlying reasons for PPP failures, it was stated that it's a deal not a program or policy. Program drivers include mission sustainability at one level, and implementation at another. Implementation involves dealing with existing laws, procedures, and organizational structures. Policy goals are often independent of third party transaction. Every deal is not just how sustainable we are but how we work it out when there are issues. It's a mistake to put a program in place just by a vision and a slogan.

There is failure to understand what the limits are—by state, by county. What worked in Colorado could fail in California. Legislative reality may make it feasible in a given state, but it may not be possible from a political standpoint. Therefore, there is a need to craft a statement of what is legally and politically possible.

Types of Contracts & PPP Tools

There is a lack of understanding of what kind of contracts are available. Instead of being tied to Energy Savings Performance Contract (ESPC) because that's familiar, you need to explore other options (UESC, EUL, PPA, etc.). You need to be open to what can be done from ECM perspective. With decreasing budgets in DOD, this is necessary to move forward. Entities like Constellation are willing to finance and take the risk; otherwise it could take a long time and may be tough to get it done.

There is no thing as one type of PPP. The third party financing can only be done when first and second parties have come to a working arrangement. For military installations, treating public as one person is not appropriate as there are multiple entities to deal with (schools, municipalities, etc.). Different people have different views of the PPP tools regarding what their rights are and what they should be negotiating. For example, land availability is an issue as many land arrangements are permissible—lease, license, access property—different people may have different assessments. What does a given tool mean? Even when people are familiar with various PPP tools, the larger picture of the framework in which to do business has not been laid out as a whole.

Contracting Officer's Perspective

According to a roundtable participant, contracting officers take money from one place and put it in another place; they are not concerned about energy investments goals and directives. Alternate financing is the last thing they want to consider. One way to educate them is to hold informal working lunches and give them what's available, so it would begin to raise awareness. The contracting officer is taking on risk mitigation. Even if they do not have the knowledge, at some point they will have to develop trust and develop understanding of risk integration among entities.

Complex but Workable Example

Procurement can come out in multiple stages and has significant risks. Constellation gave an example of how they learned this from dealing with DOD and civil side (more complicated—term limitation, reluctance to third party financing), and attempting to use contracts that included elements typically not in third party financing. Started with traditional ESPC, 10 years of brown power and added two power purchase agreements (PPAs) underneath, solar and wind, and gave them a blended rate with guaranteed savings payment and escalation over time with a budget below their expectations. So it included a traditional one that meets requirements and can be approved, and a non-traditional one for which procurement was to give a non-compliance response for additional assessment. This is different from direct

financing by other companies. Constellation is taking on all the risk for initial development, with no initial capability to push out a non-compliant solution, which could be successful in larger volumes. The process is complicated but is workable with proper education and training.

Mitigating Risks

Most comments made at the roundtable about PPPs in some way related to risk. What are the different risks with various opportunities? There are plenty of different ways to do it, there is no cookie-cutter approach. A lot of the risk (management process) is being able to know where to focus—first risk. The make up of team affects risk.

There seems to be a binary approach to risk—none or all. The party that takes all the risks takes control of every element. Whoever has all the risk, will put in safeguards and cushions. If they are not comfortable, they will push the risk to someone else. Shared risk will make it mutually beneficial, but a lot of effort is needed to figure out where that needle goes.

There is need to educate at the executive level as well as leadership level (O6 and above) regarding what savings are available, what is affordable, etc. You need to find people who want to be educated. You need to put yourself in their position. Often they don't know—long term projections; a 20-30 year commitment is a marriage not a partnership. Risks are inherent but can be mitigated.

The way the RFP or RFI are structured and the questions you ask will leave the door open or shut. Before you get to the deal making process industry players need to know what the limitations are, what's available, what the long term goal is, what tax liens local municipalities provide, etc. This would help the industry partners.

At times policy is driving what the end result is and what the limitations are and who can and who cannot do it instead of what is that we are trying to achieve—Net-Zero plus, meeting renewable energy goals or assure energy security? Focus on specific initiatives related to mission can lead to success. Chasing policy goals independent of mission is troublesome.

Conclusion

There is a need to educate at all levels to mitigate concerns, expand awareness, and increase comfort level of contracting officers to negotiate and engage in opportunities with shared risk and with new and creative contract vehicles. Mission specific approach is essential while keeping policy in mind but not the sole driver for successful implementation of contracts. A better understanding of available PPP tools and a big picture framework is needed.

Working with Surrounding Communities to Develop Resilience and Modernize Infrastructure

This roundtable explored the relationship between DOD installations and surrounding communities on the road to making installations more resilient. During this process new energy sources, energy systems, and private sector involvement are tested.

DOD Installation and Community Resilience Needs

The first thing to do when working with surrounding communities to develop resilience and modernize infrastructure is to check which installations can be retained. Is the base on the Defense Base Closure and Realignment (BRAC) list as a candidate to be shutdown?

The community has many infrastructure jobs tied to the base, and has a vested interest in the organism of the base being healthy. A healthy, well functioning base is likely to remain and therefore help employ the community. The definition of what constitutes as a healthy base may differ between the military point of view and a strictly sustainability point of view. Of course, the desire is to have all bases and their surrounding communities be healthy. Proactively working with the base can improve the image of the community and promote a positive relationship.

Renewables for Installations

Embracing renewable energy at military installations will enhance our nation's energy security and sustainability, while assisting the Army in meeting its goal of drawing 25 percent of its energy from renewable sources by 2025. The energy demand of bases is increasing and renewables are seen as good way to diversify our energy sources and hedge against power shortage by augmenting the electrical grid. The pros and cons of various renewable energy sources and their value to the different branches of the military were examined.

- **Solar:** Solar power does not always provide energy security. If the grid goes down, the solar power plant can also go down (e.g., Nellis AFB). However, newer microgrid installations allow solar power farms to be independent islands that can continue to operate even when the grid goes down. Note, there is some debate on which ones are independent and which ones are not.
- **Wind:** For the Air Force, the biggest concern is the elasticity of the air space at the base, as they are training with drones. Bases have air space rights that go to certain heights. Wind turbines interfere with radar and this has been a significant issue while planning energy security and resilience using wind power at installations.
- **Biomass:** Technology for converting bio-solids in waste to energy has substantially improved in the last decade and several demonstrations have already been initiated in and around various military installations (e.g., southwest Washington DC and Chesapeake). Europeans now have waste-to-energy plants that enable self-sufficiency and even sell back to the grid. The Army has proactively been installing some waste-to-

energy plants. The Navy uses other alternative fuels for the fleet, but is now beginning to explore waste-to-energy sources. The Air force is also exploring bio-derived fuel. Overall, however, bio-derived fuels are not quite there yet in DOD installations. Economic viability, practical approaches, and community concerns of using waste to generate energy for military bases need to be evaluated with private sector involvement and third party financing.

- **Wastewater:** Wastewater may also be used to generate energy while removing contaminants and going through the desalination process. A lot of wastewater is available at installations and can be converted to electricity. However, ammonia as an alternative fuel will not be cost effective in the foreseeable future.
- **Shale Gas:** For shale gas, a newly utilized, non-renewable fuel, technology has come a long way in the last few years. Although there are still some surface water contamination issues to be resolved, shale gas is already making a significant impact on energy production and gas prices. Coal plants are being retired in favor of natural gas. How much of this new industry is sustainable, however, remains to be seen.

Army Net-Zero Program and Community Involvement

The Army's Net-Zero program addresses three dimensions of sustainability—energy, water and waste. Fort Carson and Fort Bliss are addressing each of these dimensions and lead the pack, another 18-20 installations are addressing at least one of these dimensions. By 2020, the goal is to achieve Net-Zero energy use in some of those installations. Net-Zero programs are both good for military installations and their impact on the resources of their surrounding communities

El Paso is a great example of community and municipality cooperation. Fort Bliss has a plan to use all the waste, not just from the base but from the neighboring city of El Paso. Fort Bliss has set up a center for research joining forces with the universities and with the local community in El Paso. They also built a solid foundation working with local politicians. The ultimate goal is cheaper energy for everyone while providing backup capability for the base.

Private Sector Role

At the recent joint U.S. Army–U.S. Air Force Renewable Energy Industry Day, DOD announced that it plans to run procurements through utilities, that is, local utilities would be holding the request for proposals and selling the PPA to the government, so it would be a commercial procurement not government one. If government provides land, a hybrid scenario may exist. This plan needs further scrutiny.

The private sector has some concerns about their role as system integrators in the military initiated renewable energy system. They are uncertain about how to operate integrated solutions. For example, wind in some areas can be clustered to get to a utility scale. Other issues that arise include increased cost from using renewables, stable systems, trading of water, land use, etc.

Conclusion

Solar and wind energy has started to be utilized in military installations through pilot projects and with community support. Other renewable sources with low carbon impact (biodegradable waste, waste water, woody biomass, etc.) are being explored. Community involvement is critical to the success of healthy installations. Employing different business models that give the surrounding communities more control could avert local opposition to new energy systems. Fort Bliss in El Paso has demonstrated a successful example of working with local utilities. Net-Zero energy use programs have the potential to create more energy security, but public involvement is critical as DOD does not have the budget for wide scale deployment. Economic feasibility and wide scale deployment will require significant local community involvement and PPPs.

Supply Chain

Mitigating Risks Related to Mass Migration to Biofuels

This roundtable discussion investigated the promise of significant environmental, economic and national security benefits through the development of market scale biofuel technology. Biofuels may offer a means toward achieving cleaner air and water, provide much-needed economic stimulus and offset dependence on imported oil. Additionally, growing crops for fuel may yield valuable carbon sequestration services.

The new Renewable Fuels Standard (RFS) mandates an annual production of 36 billion gallons by 2022. However, some estimates indicate an annual production capacity of 85 to 100 billion gallons, depending on the feedstocks selected and the land area dedicated to biofuel production.

Associated Risks

There are substantial risks associated with biofuel production and deployment that must be fully anticipated and adequately addressed. These risks include financial and regulatory risks incurred by prospective producers, as well as environmental, economic, and security risks to match promised policy benefits. In developing policy to guide the development of biofuel technology, it is particularly important that we avoid a hastily developed policy framework that may yield unintended consequences and new policy problems.

Among the challenges associated with making policy determinations is the quality of data available, in particular when assessing upstream risks. Life cycle assessments (LCA) conducted using the most current data offer one means of ensuring that resources are channeled toward the right technologies. However, much of the data required to make these determinations is proprietary. Additionally, what data is available may reflect an immature degree of technological development, leading to invalid conclusions about the suitability of the technology in question.

There are also significant methodological considerations. When conducting a LCA, one must carefully determine the appropriate level of analysis. Deeper levels of analysis require more highly specified data, with consideration paid to who is gathering the data, who is doing the analysis, and the intended audience.

The intended application of a particular technology must inform policy determinations regarding that technology. A technology may be developed for defense and commercial aviation applications, but targeted stakeholders may not have the operational or institutional capacity required to rapidly absorb a switchover to biofuels. Procurement determinations currently favor the least costly alternative that meets operational objectives, and realizing long term value added by a transition to biofuels may not be possible under current procurement paradigms.

Just as a full accounting of benefits must inform decision making on technological transition, so too must a rigorous assessment of associated risks. Understanding the full range of risks is essential to conducting multi-dimensional LCA. Risks range from those incurred by prospective producers to those incurred by the country at large. From a security standpoint, it would be inadvisable to exchange our current dependence on fossil fuels for a dependence on a limited array of biofuels. From an environmental perspective, a thorough understanding of the water footprint of biofuel production is essential. Additionally, land area devoted to biofuel feedstocks is effectively removed from foodcrop production, which may result in dependence on food imports and a national food security challenge.

However, not all biofuel feedstock options offset foodcrop production—in addition to crop-based feedstock, there are also technologies that use algae and waste cooking oils. In the latter case, collection and processing facilities already exist. Even if non-crop-based fuels are favored in the long term, we may still need crop based solutions in the interim.

Even under the best conditions, it is unlikely that all potential problems can be anticipated and addressed during development. Careful monitoring will be required as new fuels are deployed across existing distribution platforms. This in turn raises important questions about who should perform system testing, and who should guarantee its efficacy.

Biofuel Policy

Fluctuation in biofuel policies presents a risk in its own right. With regard to metrics selected, there are important questions about the appropriate unit of analysis, as well as intended end uses and the level of information required.

We are unlikely to see consensus on LCA criteria in the short term. Consensus is more likely to emerge on the range of data indicators acceptable, which will be both necessary and sufficient to enable sound decision making. Even so, we should not rush to make assessment prior to developing sufficient knowledge. Policymakers may look to modern financial portfolio theory as a model for managing risk—risks can be managed effectively with adequate diversification of

resource investment, and feedstock alternatives should be considered both individually and collectively.

From a financing perspective, producers and policymakers alike will need to address market entry barriers associated with our legacy of fossil fuel production. The price of fossil fuel is an important influence on the price of biofuels. Another is the cost of other agricultural commodities. Recent work by the U.S. Department of Agriculture (USDA) indicated that current ethanol production has not adversely affected food prices, but did impact production of cotton. Conversely, farmers may yield higher profits by growing other crops, which would affect the stability of feedstock supply.

There are also important operational considerations. From a logistical perspective, will biofuel manufacturing to be collocated at existing refineries, or will it require new refining facilities at other locations?

Developing an Energy Plan and Strategic Technological Roadmaps

The need for an effective national strategic roadmap for biofuel technology is clear. Planning horizons that coincide with the electoral cycle will not be adequate to address the challenges associated with the deployment of market scaled biofuel technology. Similarly, a policy program where new technological developments are addressed ad hoc is unlikely to adequately realize the full potential of emerging technologies. In the absence of coherent policy, the prospects of biofuel development will remain fraught with uncertainty.

It may be difficult to develop a national policy in light of international economic and security considerations, but a well defined long term energy plan is essential, and must include technology specific roadmaps. A long term energy policy must address the full range of operational and regulatory risks, and be developed based on core criteria informed by the most current and reliable data available.

One avenue toward developing a coherent national policy begins on the demand side. Engaging large fuel consumers (e.g., large corporations and DOD) offers a means toward aligning policy determinations with end user needs, perhaps using PPP as a vehicle. Additionally, the Commercial Aviation Alternative Fuels Initiative (CAAFI) serves as one example of an industry forum that could aid in identifying appropriate technologies and in fostering consensus on their development. Commitments entered into by public and private sector stakeholders at international environmental summits may also serve similar purposes.

Just as alignment of policy demanders can serve to drive policy change, coordination among the states may also serve to drive the development of regionally appropriate technologies. However, whether government alone should own or drive change may ultimately be a question of financing.

Nonetheless, significant government involvement will be required so that risks are adequately contained. Government should not artificially prop up a particular technology indefinitely—it is

essential that there be a predetermined phase out of government support. Operational demonstrations by industry will be essential to assess and manage technological risks, and policy must be formulated accordingly.

Assessing Risks in the Supply Chain

This roundtable focused on the sustainability activities of GSA. Topics included the launch of a new website aimed at building a cross-sector “Community of Practice” to promote sustainable supply chains as well as ways that GSA is seeking to comply with Executive Order 15314 through sustainable supply chain management and procurement.

Sustainable Supply Chain Community of Practice Website

The Sustainable Supply Chain Community of Practice (SSCCP) on Data.gov, being launched by GSA, is open to all interested parties, including other agencies; representatives from DOD, EPA, DOE and Commerce have already expressed interest in participating. GSA will be looking not only at environmental impacts in a supply chain, but also chain of custody (tractability). This has particular relevance from an IT security perspective and is not frequently included in the definition of supply chain sustainability. It is hoped that the Community of Practice will yield insights on metrics to gauge the sustainability of a supply chain. Vendor size and which market sector they are in influences their movement towards sustainable supply chains (larger vendors have more resources to conduct a GHG inventory versus small businesses). GSA will be seeking to understand how different industry players are approaching supply chain sustainability and what lessons learned nonprofits and other membership organizations can provide to all of the community participants.

The Community of Practice is voluntary—GSA intends that the data shared serve as a resource for interested parties in the private sector (with information shared only as appropriate), as well as nonprofit and academic entities. The United Nations Environmental Programme (UNEP) announced the launching of a sustainable procurement related portal at the recent Rio+20 sustainable development meetings and the Community of Practice may become part of that portal. Public sector procurement represents approximately 14 percent of gross domestic product (GDP) but is a much higher percentages of GDP in developing economies. It can therefore act as a significant driver in realizing sustainability objectives. The UNEP portal is motivated by this realization.

Sustainability Initiatives at GSA

Executive Order 15314 mandates that “95 percent of all new contracts, including non-exempt contract modifications, require products and services that are energy efficient, water efficient, biobased, environmentally preferable, non-ozone depleting, contain recycled content, non-toxic or less-toxic alternatives.” Consequently there is general interest in expanding the definition of what constitutes a sustainable product. GSA chairs the Section 13 Interagency working group which has drafted guidelines on how to include use of at non-governmental eco-labels and environmental product standards in the federal procurement process. Right now,

only government authored labels and standards are being advocated for use in procurements and there are not enough of them to cover all of the products agencies buy through GSA. There are many existing products that would help the government become more sustainable but they are difficult to identify because of the limited number of government authored labels and standards. Expanding to use non-governmental labels and standards would increase market share for vendors who have invested in making their products more environmentally friendly. In order to encourage the adoption of sustainable procurement practices, GSA developed a Green Products Compilation. It is also developing an acquisition worksheet template in order to help automate inclusion of sustainability requirements in procurements. Along with product sustainability, GSA has a pilot project looking at the use of vendor sustainability management practices in procurements. GSA holds that sustainable procurement begins with the program manager's needs, and program managers are best positioned to drive the transition to more sustainable procurement. Consequently, relevant training needs to be developed, organized, and directed toward them.

GSA will be seeking to effect a shift away from the longstanding lowest cost acceptable criteria toward use of best value criteria. Using a life cycle approach, GSA will be assessing costs associated with environmental impacts, such as energy consumption, not only in products' use phase, but also during the end of life phase.

Life cycle logistics is concerned with all material attributes from sourcing to disposal, including issues arising from systems support (maintenance). Better connections with systems support personnel are critical to realizing larger sustainability objectives.

Recycling of alloyed materials is already occurring, but is complicated by the very fine tolerances of material composition. Decommissioned aircraft may represent another source of material for recycling. However, intelligence on regulation materials will be important vis-à-vis material obsolescence standpoint.

Many large organizations already engage in assessment and disclosure of environmental impacts. It is in the interests of all parties to look at the current range of disclosure activity and identify means toward reducing redundancy.

When GSA looks at cost, it should address total cost, to include GHGs emitted, water footprint, etc. Industry is moving towards an integrated reporting framework in which these costs are reported (though not yet amortized). Questions on quantifying requirements remain, but will ultimately be resolved, just as they will in the private sector. There are huge opportunities to be realized vis-à-vis technologies and innovative uses of data associated with optimization of supply chains. SAP is an example of a company capitalizing on this trend and developed a product suite based on using sustainable supply chain data.

Built Environment

Enhancing Resilience in the Built Environment

This roundtable was primarily used by participants to introduce themselves, their work, and their interest in resilience in the built environment, and then network in small groups with other interested individuals. The makeup of the group may give some notion of the types of side conversations and connections that took place. Of the 17 individuals that participated in the roundtable:

- Ten worked in private industry, three worked for nonprofits, three worked in the federal government, and one worked in academia. Of the ten individuals working in private industry, six worked in consulting. Other areas represented in the panel included manufacturing, renewable energy, facilities management, and trade associations.
- Four were the President or Director of their organization.
- Four possessed some sort of LEED certification.

The individuals present also expressed a broad range of interests associated with the built environment. Some of the subject area interests of the roundtable included:

- Waste-to-energy solutions
- Energy efficiency
- Community sustainability
- Energy efficiency
- Microgrids
- Climate change adaptation

Many important conversations and connections were started after the introductions were made. Roundtable participants quickly gravitated toward others who had experiences or interests relevant to their own. In groups of three or four, members discussed the issues most important to them with other highly interested individuals. Although this roundtable method did not create a cohesive group discussion, it enabled participants to engage on the subject matter that was most important to them.

Developing and Transitioning to Renewable Energy Technologies

This roundtable provided a forum for participants to discuss issues related to their experience in the renewable energy field. Participants used the forum to put forward what they saw as some of the biggest challenges to implementing renewable energy projects in the United States, and worked as a group to brainstorm solutions and what they wanted to see in terms of policy and tools going forward. Some of the topics that came up during discussion are presented below.

- One participant expressed frustration with how difficult it was to get approval for projects in the United States compared to internationally. Projects that had been rejected in the United States, were able to be funded and constructed elsewhere much more easily. Additionally, the participant noted how much easier it was to work with Native American reservations for renewable energy projects due to their lack of red-tape and zoning regulations.
- Other participants noted the deficiencies in existing renewable energy programs. Some participants were supportive of the Property Assessed Clean Energy (PACE) program, but were discouraged that the program seemed to be being phased out by the government, and that Freddie Mac and Fannie May had not been effective enough in leading and implementing the program.
- Participants discussed Leadership in Energy and Environmental Design (LEED) certification, noting that while the LEED standard was very effective on the building scale, the LEED community program has not really taken off yet.
- Participants expressed the desire to make PPAs and RFPs more coherent and streamlined. Ideally, the participants wanted to see federal leadership on RFPs and standardized terms for PPAs.
- Another challenge discussed was simply the lack of funding available. Funding for green projects goes down during tough economic times, and it can be difficult to get developers to support projects. A solution presented was to work to educate developers to get them on board with renewable energy and energy efficiency projects.
- One solution presented to help communities learn best practices was to coordinate and share knowledge with local DOD and GSA owned buildings. Participants viewed DOD as a leader in this field.
- The main idea that emerged at the end of the session was the development of a book of best practices for renewable energy projects, similar to the LEED standard for buildings. Seeing a lack of leadership and funding at the federal level, participants thought it would be beneficial to create a private standard containing all the best practices in one place to be used to evaluate and compare renewable energy projects.

While the conversation in this roundtable session veered quickly from topic to topic, one point that was brought up again and again was the lack of cohesive federal leadership in renewable energy. This lack of leadership, along with lots of red-tape, can make it difficult to develop renewable energy in the United States. In the absence of federal leadership, participants saw an opportunity for the development of tools such as private standards the same vein as LEED.

Adaptation and Resilience

Integrating Climate Science into Operational Strategies and Long Term Planning

A recurring theme throughout the roundtable discussion included the importance of communication—the right language, climate projections, and method of briefing—in order to

help policy makers effectively integrate climate change information into existing operational and planning processes. The discussion highlighted the alternative language and concepts to use when thinking about response to change, the importance of best and worst case scenario thinking in building design and planning, the use of high level vulnerability assessments in targeting critical assets, the need to quantify risks and benefits of intervention, and the need to contextualize conversations about climate change in terms of organization missions.

The discussion began with a look at the key terms of adaptation, resilience, and sustainability and how they might inform the overall conversation regarding climate change and participants shared their experiences with different word choices. Resilience may be a preferred term in certain governmental forums, as it does not appear to cause as much oversight or concern as the word sustainability. A critical issue in this particular conversation is change and the right language and terminology would highlight the fact that we're dealing with a response to change. The term sustainability does not communicate a response to change, while the terms resilience, adaptation, and perseverance may more clearly communicate this notion.

Response does not necessarily cover everything that we attempt to do with adaptation and resilience planning—we are also predicting and anticipating threats, and not just responding to observed or current threats. The goal is to both respond to observed threats as well as to attempt to be proactive and plan for possible future threats.

- The terminology also varies in the field of risk management, where a mitigation strategy may result from predicting that there will be no water resources and preparing for that threat, while adaptation is the response to an actual or current threat.
- There is tension in acquiring the necessary resources and attention in order to be proactive in planning for potential future threats. Those communities that have experienced historical threats are more likely to be proactive. The lack of certainty and the reliance on projections makes it more difficult to convince politicians and authorities to act.
- In particular, the emergency response community has honed in on useful language with a culture of risk prevention and not just a response to past or current incidents.

With respect to building design, there may be existing decision making processes that can be slightly modified to accommodate the increased extremes anticipated over the next 50 to 100 years.

- Moving forward, relying on historical trends may be deficient, and this may mean that a building is not ready for an increase in cooling days or other extreme weather changes over time. Some decisions, however (e.g., increased insulation) can be implemented at a relatively low cost—the risk of inaccuracies in the projections is decreased because the method of adapting does not have a large upfront cost and will yield value under essentially any future scenarios. In other cases, choosing a certain piping size (e.g., storm culverts) could result in a financial loss if increased rainfall projections are wrong.

- In a long term decision scale, an organization will not want to go with historical data or completely with projections. They would have to plan for multiple potential scenarios, based on confidence level. It could become a major planning dilemma; however, it should be noted that engineers and building designers are trained to think about the best and worst case scenarios and to adapt their system accordingly.
- In planning, some cultural shifts in the way to integrate trends into our decisions are necessary, as long term climate shifts are not currently considered. This includes natural long term climate variations, and not just that these shifts are being exacerbated by climate change.

Two activities that will help agencies address climate change include high level vulnerability assessments and integrate changing climate into operational and organizational planning. The perception may be that once these activities are complete, even though their outcomes are just electronic files and paper, they provide important steps for agencies to understand and prioritize their risks resulting from climate (and other) change. The vulnerability assessment in particular allows agencies to determine not only which locations are the most vulnerable, but also those that are the most critical.

Moving forward, it will be important to quantify not only the risk but the benefits of early intervention. The insurance industry may have some insight into regularly assessing and quantifying risk. The insurance industry has met with the National Academy of Sciences to assess the risk of climate change and is attempting to find better climate models because they need to be able to insure on a long term scale. The re-insurers (the companies that insure insurance companies) are already investing in their own models to be able to assess climate change.

When it comes to moving a bureaucracy, risk needs to be assessed in terms of the mission—there is a need to show that the mission itself is at risk. If alterations to current business processes are seen as part of maintaining strength and readiness for the mission, it may elevate the threat assessment or security assessment, and there is not as much of a need for climate projections to be 100 percent certain.

Collaborating with International Organizations and Government Entities to Enhance Resilience

If climate change mitigation efforts do not achieve what they need to, communities' resilience to climate change becomes a fairly significant issue. Resilience implies the ability to bounce back after a shock, but resilience to climate change implies that communities need to be prepared to bounce back in advance. To do this requires infrastructure related policy decisions made well in advance of projected events. Challenges faced include coming up with a coherent approach to risk and developing common definitions and language to speak about resilience across countries. This includes breaking down government silos and sharing knowledge, best practices, and a broader understanding of the problem faced as well as not duplicating analytical efforts. The key questions debated in this discussion included:

- What are the most correct or actionable forms of cooperation at the international level? What international groupings will be the most effective and efficient in enhancing collaboration? How does international collaboration transfer to collaboration at the national level?
- What forms of action are most appropriate? Are security institutions better candidates for actual action?

Collaboration and Addressing the Question of Useful Organizations

International efforts and forums are complicated or rendered inefficient in part because there is a phenomenal amount of distrust between developed and developing world, largely due to commitments and then subsequent inaction from the developed world. The developing world also has distrust because of issues of neo-colonialism: if there is a perceived risk, what does that allow the developed world to do to neutralize the risk?

- The United Nations Security Council meetings last year did not make progress on addressing climate change peacekeeping. It can also be noted that if just the Security Council is involved, there is an issue of not having the right people (especially those nations climate change will affect the most) at the table.
- How can confidence be created between developed and developing nations? It may be helpful to reframe what the international community considers a developing nation. Until there is a renegotiation of significant aspects of how developed and developing nations interact, the issues may be frustrating and change or progress is difficult.
- Many of these issues stem from a debate about money and economics—in part because there is a persistent paradigm that economies are measured in terms of growth. Reassessing development in terms of a green economy might allow certain nations to move forward while promoting sustainability.

Collaboration in the scientific community can and has worked in the past, despite traditional reservations about sharing information between nations. There have been successful common or cross governmental research projects. Collaboration in developing aviation systems indicates that collaboration can happen between nations.

The existing international organizations have brought some good ideas to the forefront, including the Green Fund.

Accurate and Actionable Information

Policy makers need to have correct, actionable information. Some work has been done, as Pershing noted in his lunchtime comments, in linking climate with conflict areas and resource strains. A few years ago, the African Union discussed the potential link between climate change and the famine and conflict in Darfur.

Part of the problem is that there is still a data gap in the direct correlation between climate and conflict. There has been some research, but there are still regional data gaps. Some reports have been developed to attempt to take a look at risk, climate and conflict, including one developed by the United Kingdom's Ministry of Defense (MoD).ⁱ Another example is the flagship report developed by the German Advisory Council on Global Change (WBGU) in 2007.ⁱⁱ The WBGU report may be the most comprehensive document completed to date; however, even this report can be too generalized at times.

Scenario building workshops with emergency planners have provided interesting case studies and information in the past—giving these planners an idea of what might happen on a five or 25 year time scale and allowing them to develop responses for those potential scenarios. It may be that this community offers knowledge or a level of collaboration that can be used.

Linking climate change to other regional issues may produce the actionable information that is needed.

Involvement of the Security Community

There is currently some disagreement as to whether the securitization of climate change is a good or bad move. It may be helpful in getting developed nations engaged; for developing nations, the response to climate change must be couched in terms of greater prosperity. Securitizing climate change and avoiding accusations of neocolonialism requires that the international community rethink the nature and purpose of military involvement and a re-conceptualization of conflict: it becomes more about humanitarian aid and development in the pursuit of preventing eventual conflict.

- There is currently an effort at DOS attempting to look at and move on sustainability in a geopolitical way.
- Security institutions may be beginning to take a look at the issues, but this does not necessarily mean that security institutions will be the actors. The comment was made that DOD has broadly stated that civilian institutions will be taking action, and that DOD will help. United Kingdom security institutions are looking at economic solutions as a way to prevent future conflict.

ⁱ <http://www.mod.uk/NR/rdonlyres/58799038-34D2-4A93-94C8-6BBF770B9EA0/0/MODClimateChangeStrategyFINAL.pdf>

ⁱⁱ <http://www.wbgu.de/en/flagship-reports/fr-2007-security/>