EXECUTIVE FORUM ON BUSINESS AND CLIMATE
SUMMARY (DRAFT)

The Executive Forum on Business and Climate was a 2-day knowledge exchange forum, co-convened by Climate and Energy Solutions (C2ES) and the Cooperative Institute for Climate and Satellites – North Carolina (CICS-NC), focused on climate-related risks and opportunities for private sector businesses. Key points raised during the workshop included:

- Due in large part to recent extreme weather events worldwide, businesses are increasingly aware of the potential risks of climate change and are seeking ways to more effectively analyze and manage those risks.
- When assessing vulnerability and climate risks, decision makers often struggle with the question "where to start?" Many of the speakers recommended beginning with an examination of existing strategic priorities and challenges, which can illuminate attitudes about risk; the spatial and temporal scales most important for decisions; and the assets, resources, and services that are of greatest value.
- Leading companies have reached out to university and government experts to help them understand the risks of extreme weather and climate change, but these connections have been formed on an ad hoc basis and no readily accessible source exists for credible, user-friendly climate information.
- There is a need for improved communications between the public and private sector – companies need to better understand what data is available from the government and the government needs to better understand what is most of use to the private sector.
- Businesses rely extensively on public infrastructure (roads, ports, shipping channels) that is also vulnerable to the impacts of extreme weather and climate change. Identifying and implementing public infrastructure solutions will require cooperating with the responsible public agencies to develop plans for enhancing resilience.
- Insurance can function as an important tool in both communicating risks to potential policy-holders, in providing financial incentives for investing in resilience, and in helping companies hedge against the costs of impacts.
- When pursuing resilience planning, businesses are interested in identifying opportunities, in addition to managing or minimizing risks. As part of this, understanding the costs and returns associated with taking action is important, in addition to the costs of the impacts themselves.

This document summarizes the various sessions and discussions that took place during the workshop. We also present several potential next steps for designing and convening future Executive Forum workshops.

The Executive Forum on Business and Climate took place on November 4 and 5, 2013 in Washington, DC. The event explored industry's needs related to climate data, information, and decision-support tools, as well as the avenues for engaging with government agencies such as NOAA's National Climatic Data Center. The workshop aimed to strengthen the relationship between business and industry leaders and NOAA's climate science team, identifying ways to access technical expertise. In total, the workshop hosted 44 attendees over the two-day period, including 21 representatives of private-sector organizations.

The workshop organizers and facilitators included the following key people:

- Otis Brown, Cooperative Institute for Climate and Satellites – North Carolina
- Joe Casola, Center for Climate and Energy Solutions
- Jenny Dissen, Cooperative Institute for Climate and Satellites – North Carolina
- Andrew Hoffman, University of Michigan
- John Macomber, Harvard Business School
- Janet Peace, Center for Climate and Energy Solutions

This summary report lists some of the **issues discussed during each session**, and presents some **potential next steps** for the Executive Forum activities. Lastly, **the meeting agenda and participant list** are attached to this report.

Session Recaps

Session 1 - Climate Conversation

This session focused on how scientific assessments connect to business decisions; what some of the recent observations of the climate tell us about risks related to temperature and precipitation; and how NOAA places a high priority on the establishment of public-private-academic partnerships to advance decision support related to resilience planning.

- Adaptation/resilience planning at the national level often proceeds without the inclusion of private sector input.
- Private sector companies are often most interested in resilience planning if it can be connected to shorter-term returns (i.e., profits or revenues occurring in the next year). This is especially true for smaller business that may be more sensitive to changes in year-to-year revenue; larger businesses have the capacity to make decisions in which benefits would accrue over longer time periods.
- Disruptions of globalized supply chains by extreme weather events serve as examples of the vulnerability of business operations to climate variability and change. These events also demonstrate that businesses may be affected by weather and climate conditions occurring in many regions of the world, sometimes beyond the locations of their immediate facilities.
- From NOAA's perspective, a public-private partnership offers a number of potential mechanisms for improving the provision of climate information and the quality of decision-support tools. There are some "models" for pursuing these partnerships within the weather community, and in engagement of individual sectors, but many efforts have been "one-offs."

Session 2 - Climate Data to Decisions

This session explored examples of applications of weather and climate data for corporate decision-making.

- Examples of impacts discussed included riverine and coastal flooding. Looking toward the future, the former can be exacerbated by stronger storms; the latter can be made worse by stronger storms, sea level rise, and local subsidence and erosion. The impacts of warming temperatures on the reliability of ice roads were also presented.
- The water utility industry is seeing declining usage due to more efficient technology (e.g. more efficient appliances), but greater peak usage from more variable weather. Peak usage is the main driver of capacity requirements, so this presents a dilemma for design and infrastructure decisions.
- Infrastructure in low-lying coastal areas, especially around the Gulf of Mexico, is highly vulnerable to climate impacts. Companies in the region are reaching out to their customer base, attempting to raise their awareness of risks, in addition to fortifying existing assets.
- Estimates of adaptation costs for water and energy systems across the country are in the hundreds of billions of dollars for the coming decades. Ongoing actions will be necessary; resilience will not be achieved with a single set of decisions.
- Options to build resilience include: hardening assets, relocating assets, building higher flood protection, and developing on-site energy sources.
- Estimating the costs of adaptation options allows for prioritization, with the lowest cost options pursued initially.
- NOAA can help infrastructure and utility managers by increasing access and national coverage of historical climate data with long periods of record, improving short/medium-term (e.g., weeks to months) forecasting particularly related to drought, increasing the spatial resolution of data products, and providing tools and guidance for climate change planning (e.g., guidance in interpreting climate model output, advice about adjustments to the historical records and recurrence intervals)

Session 3 - How Does Climate Data Affect Business? (Part 1)

Breakout groups included 6-8 attendees each, and each group included a mix of academic, corporate, consultancy, and government representatives. The groups discussed ways that climate impacts can pose a threat or an opportunity to production costs. The below table provides a list of some of the discussion output.

THREATS THAT POTENTIALLY INCREASE COSTS	OPPORTUNITIES TO POTENTIALLY LOWER COSTS
• Disruptions to supply chains • Damage to facilities • Damage or disruption to transportation networks • Reduced yield or increased price of agricultural products • Reduced availability of insurance or increased costs of insurance • Health risks to customers or employees • Loss of customer base resulting from climate-related damages or relocation • Damage to corporate reputation or brand • Regulatory action that could impede or raise the costs of resilience actions; regulatory inaction that could exacerbate risks	• Enhanced energy efficiency and energy conservation • Hardened infrastructure • More flexible or spatially distributed supply chains • Spatially distributed facilities • Rewards for early action, such as reduced insurance premiums for boosting facilities' resilience • Opportunities to reach out and educate customers • Innovations in data management or materials

Session 4 - Climate Models as an Information Resource

This presentation served as a primer for climate models, highlighting their strengths and weaknesses in representing different variables at different spatial and temporal scales.

- NOAA maintains numerous tools that provide information on future climate, ranging from a lead-time of a few weeks to several decades. In addition, NOAA provides information about real-time climate monitoring and historical conditions, which can also be valuable in planning for the future.
- In general, our understanding of season-to-season and year-to-year temperature variability is better than our understanding of precipitation variability. The difference becomes more apparent at smaller spatial scales. The relationship between these forms of variability and the risk of specific, local extreme events is an area of active research.
- Uncertainty should not be translated as ignorance. We can often diagnose the factors that make it difficult to make precise predictions of future conditions. Some of these factors are simply not "knowable" in the present (e.g., the future trajectory of greenhouse gas emissions), while others relate to our physical understanding of specific processes at specific spatial and temporal scales (e.g., understanding local rainfall variability at the seasonal time scale is still limited)
- Some key questions raised by businesses to the scientific community: are there metrics available regarding the accuracy of forecast, and if so, are they published?

Session 5 - Integrated Federal Perspective on Climate Information
This section was cancelled, as the speaker was unable to attend.

Session 6 - How Does Climate Affect Business? (Part 2)
Using the same groups from Session 3, breakout groups brainstormed ways that climate impacts can affect revenues. This conversation focused primarily on opportunities, and the output is summarized in the following table.

OPPORTUNITIES TO IMPROVE REVENUE

• New products and new/expanded markets
  o Climate data and services
  o Demand management tools (e.g., for water or energy)
  o Water efficiency, filtration, and reuse technologies
  o Home resilience (e.g., materials that minimize wind or flood damage)
  o Drought-tolerant seeds and agricultural practices
  o Distributed energy generation and biofuel technologies
  o Risk transfer products, such as insurance
• Innovative land use practices and valuation/harnessing of ecosystem services
• Diversification or development of new feedstocks for manufacturing
• Coupling and leveraging mitigation and resilience activities
• Community-scale planning in collaboration with customers and employees

Session 7 - Examples of Best Practices
Presentations in this session drew upon examples of resilience planning pursued by companies and organizations, highlighting some of the best practices and lessons learned.

- Specific examples included assessments that focused on supply chains, industrial activities related to mining and mineral extraction, investments and ongoing projects supported by international development banks, and electricity demand and supply within the United States.
- Establishing science literacy among potential users of climate information is important.

- keyword choice and language can be important.Discussions of "resilience" often generate more interest and less opposition than "climate change."
- It's important to begin a resilience conversation by focusing on the existing priorities and challenges faced by a business. Once this basis set of issues has been established, the importance of climate impacts can be placed into a proper context, i.e., the role of climate should be viewed through the lens of a decision maker's existing obligations, concerns, and goals. Such engagement can be a valuable means of educating both the decision makers and the climate data provider.
- National/federal agencies can set an example by making climate a priority. Public-sector preparedness should be robust, as business looks to these organizations for leadership.
- The private sector can address vulnerability by investing in public sector projects, developing new goods and services, altering design or operational standards and protocols, and through corporate philanthropy.

Session 8, 9 - Evaluating Climate Risks and Opportunities/ Group Discussion/ Questions and Answers

Sessions 8 and 9 were combined into one session, continuing the discussion of examples and best practices. These sessions focused more on public sector decisions, and the diversity of data-driven tools that inform planning and decision making for a variety of near and long-term risks associated with different climate stressors.

- Specific examples included understanding hydrologic change at the local scale for water resources management, vulnerability of a regional transportation system, and a comprehensive multi-stressor risk assessment for a Native American tribe.
- Scoping is a critical first step in identifying vulnerability. A pre-requisite to managing risks is having a clear idea of "What is important? What are the resources whose vulnerability would represent a concern?" What are the timeframes for decision-making; what are the relevant planning horizons?" Answering these questions is largely a non-science endeavor – it involves values and priorities that exist within an organization or community.
- Scenario planning can be a useful tool to manage uncertainty about the future, whether the uncertainty stem from climate projections or other factors (e.g., economic changes, population growth, other environmental stressors).
- Climate data tools must be "user friendly" and fit into existing decision-making processes (e.g., use similar language, focus on similar time scales) if they are expected to inform decisions.
- Decisions about what is vulnerable and the parameters of decision making (e.g., level of risk tolerance, time scale for planning) can drive the selection of climate information that is used in a vulnerability or risk assessment.
- Data providers and science experts can help tie climate stressors to these important systems or resources.
- Even perfect information from scientists may not be enough if processes are not in place, or decision options are not available, to take advantage of it.
- Academics can create tools, but are often ill-equipped to do operational work. It will fall to the government and private sector to carry out more applied work and maintain data tools over time.

Lunch Conversation and Discussion

Over lunch, Susan Ruffo from the Council on Environmental Quality spoke about what the government is doing on climate resilience and on building a relationship with the private sector.

- Bolstering resilience requires significant action at the local level; the federal government will need cooperation from many entities that can operate on more local levels.
- The recent Executive Order is aimed at agencies, but the federal government is looking at how it can help and engage with the private sector. There are many potential pathways for engagement, both through specific programs or agency/interagency bodies.
- The National Institute of Standards and Technology is working to develop building standards that could offer states and localities guidance when making structures more resilient.

Session 10 - Operationalizing Considerations of Risk and Opportunities

Session 10 involved a facilitated discussion about risks and opportunities for private sector businesses. The discussion drew on the breakout group output generated in Sessions 3 and 6 (see Tables above). Some overarching points are presented below.

- Many participants agreed that bolstering the resilience of infrastructure is important. Due to the scale of the investment required, improving infrastructure represents a significant business opportunity. Finding mechanisms to tie infrastructure improvements to financial instruments (e.g., municipal bonds) could help raise capital for such projects, or get investors focused on infrastructure needs.
- The role of customers is also important. Customers' ability to manage risks and avoid suffering losses from weather and climate events can have an important effect on business - when customers do well, companies do well.
- There is a need to further develop the knowledge base around resilience; the gathering of more "case studies" would be helpful for businesses and the academic community.
- Participants were interested in examining and addressing climate vulnerabilities and risks in a cross-sectoral, integrated manner. Looking at the problem in a single-sector "silo" was likely to obscure important interconnections (e.g., the relationships among energy, water, and land use) and potential opportunities to build resilience.
- There is a need for cost information, both regarding the costs of impacts on business and costs of taking action to build resilience. Services provided by ecosystems may represent an important factor in gauging risks and opportunities. More information may be needed to appropriately assess the value of ecosystems, and the way this value may be affected by future climate conditions.
- To help fill the informational gaps associated with assessing risks and opportunities, there could be greater cooperation and sharing of information (especially related to costs) across or within industrial sectors. One potential model is the way in which insurance companies share information about claims and damages.
- Participants discussed the idea of a "bridge" between data producers, like NOAA, and decision makers in business. It would be useful to map out the respective roles of the data producers and decision makers, as well as the roles of intermediaries (e.g., consultants) that can tailor tools to specific user needs, and boundary organizations (e.g., trade associations) that might facilitate the establishment of such a bridge.

- There are some critical questions in considering the potential for a climate services enterprise:
    - Where does the demand for climate-related decision support currently exist? To what degree does "latent demand" exist? For some companies, the demand will be very high and easily recognizable, while for others it will be less acute or not immediately acknowledged.
    - How do you drive demand?
- Trade organizations may represent a good entry point to identifying specific gaps and efficiently disseminating information (e.g., design manuals). These groups can develop standards and lower the bar for implementing resilience plans.
- In many organizations it can be difficult to get facility managers to buy into resilience. Risks and opportunities must be translated into their language and put into the context of their priorities.
- Risks and opportunities are not always "symmetric" for all users. A lack of information about future extreme weather events may constitute a large risk to a company, yet investing in the research regarding extreme event frequencies (either by that company or a third-party entity) may offer a relatively small opportunity. This is especially true if decision options are limited (i.e., what to do with the climate information?).

Sessions 11 and 12 (which were combined into a single discussion) - Gaps and Needs for Assessing Risk and Identifying Opportunities; Actions to Support Public-Private Partnerships

In this session, attendees were separated into three 3 groups: Industry, Government/Academia, and Consulting. Each group was asked to identify gaps and needs related to resilience planning. In addition, groups discussed the potential role that their representatives could play, and the potential roles of the other groups in thinking about a climate services enterprise. The session concluded with a facilitated discussion of the breakout group output, and solicitation for next steps.

- Many businesses don't understand their current vulnerability to climate impacts; they lack a "baseline." When engaging businesses, trying to establish their baseline vulnerability in a qualitative manner, often through discussion of strategic priorities and specific weather and climate events (as opposed to leaping into an in-depth risk analysis), can be a useful starting point. From this qualitative understanding, more sophisticated, quantitative assessments can be scoped.
- Several questions arose to motivate further analysis and research:
    - Can more "success stories" be gathered and analyzed to demonstrate how companies can effectively manage climate risks and seize opportunities?
    - Who within companies is being tasked with tracking resilience? How is this responsibility related to other sustainability tasks (e.g., filling out CDP surveys)? How is resilience being integrated (or not integrated) into sustainability measures?
    - How can resilience planning play a part in dealing with crises (e.g., rebuilding after a hurricane), as well as in dealing with "creeping" or slow-onset problems (e.g., wetlands loss due to sea level rise, ecosystem shifts to higher latitude/elevation in response to warming)?
- Although federal agencies may not be able to develop solutions for individual private firms, the government has an important role of "moving" data and tools out of academia. Consultancies are well positioned to more directly engage individual firms and tailor solutions. Finding the tools that will appeal to a broad cross-section of industries and companies remains both a challenge and opportunity.

- Identifying models of engagement on resilience issues that span public-private-academic "silos" is valuable. The experience in New York City was lauded by participants as an example of effective cooperation among many public sector entities, scientific research groups, and private sector companies. The role of the Mayor and his political leadership in bringing together high-level participation in the resilience process was noted as a catalyst for the effort.
- To facilitate resilience planning within the private sector, a "Bloomberg" (financial product) style tool could be extremely effective. Such a tool would combine/consolidate available data into a more usable format that could meet a wide range of customer needs.
- Insurance is an important tool from the private sector for communicating and managing risk. For small and medium-sized business, the risk communication factor could be especially important, as these firms often operate on relatively short time horizons, making the explicit consideration of climate impacts difficult.

Session 13 - Concluding Remarks

To close the discussions, Andy Hoffman synthesized several key points that emerged regarding the continued conversation between climate data providers (whether they be public or private) and businesses planning to bolster their resilience to climate impacts:

- Recognition of differences in language/jargon. Business leaders focus on metrics such as revenues, capital costs and consumer demand, while climate scientists often track statistics connected temperature and precipitation. Understanding how these factors can "translate" between the groups is important, and can often require mutual education of each respective group.
- Recognition of differences in time scales of interest. Businesses may place emphasis on quarterly or annual performance, while climate scientists may be more focused on longer-term changes. Finding overlap between theses time scales is important for productive engagement.
- Sustained engagement with increasing sophistication over time. Incorporating concepts of resilience into corporate decision-making takes time, and often builds from qualitative screening assessments to more complex, quantitative analyses of adaptation options.
- Business role in larger public discussions of resilience. Businesses can act as important validators for pursuing resilience, and can help motivate other types of decision makers to consider adaptation options.
- Understanding the context of the larger marketplace. Businesses are sensitive to the conditions of the markets in which they operate. As such, timing is critical – early efforts on resilience are likely to be rewarded if they are taken prior to the competition, but may be relatively expensive or yield minimal benefits if pursued "too early," relative to competitors.

Potential Next Steps

One conclusion from the attendees: the conversation about climate data and decision support tools involving such a diverse mix of private sector industries, while interesting, is not an efficient platform for identifying specific data/tool needs. Future engagement activities would benefit by bringing together groups that are more homogenous, or at least share a set of resources and climate concerns. In this vein, future Executive Forum meetings could be:

- Sector-focused. Examples include electric utilities, water utilities, or agriculture. CICS-NC is in the process of planning a Forum focused on the insurance and re-insurance industries, which was also potential target sector.

- Region-focused. Private and public sector stakeholders from a particular region (e.g., the Gulf Coast, the Chesapeake Bay) could be brought together to discuss potential data needs and decision support tools.

There were also several knowledge gaps mentioned during the workshop discussions that could guide future research and engagement activities. Potential future activities include:

- Gathering and synthesizing more information about the costs of impacts, including a comparison of the costs of inaction versus the costs of pursuing specific resilience options.

- Further exploration of accessibility and usability of climate data and decision-support tools. There is broad interest among businesses in being able to acquire data and tools that can inform decision making. A number of issues related to access and usability were raised, including: historical data may not be readily available (especially for locations outside the U.S.); future projections may be difficult to interpret, especially for spatial and temporal scales at which decisions are made; and assessments of vulnerability may not be available for all locations and resources of interest. Future workshops or research investigating ways to improve data access and match data products to the needs of decision makers would be helpful.

- Collecting more case studies and best practices. There is a growing body of knowledge among public and private organizations regarding resilience planning. Participants were interested in sharing what they have done, and learning how other groups' experiences can inform their future plans.

- Investigating policies that might facilitate or impede companies' efforts to bolster their resilience. Examples that were discussed include data sharing arrangements that exist among companies or within national meteorological services; regulatory constraints on utilities that operate or maintain infrastructure; regulatory constraints on insurers; and incentives and disincentives for construction and development, especially related to building codes.

- Characterizing existing or new financing mechanisms whereby capital could be raised to support infrastructure replacement or upgrades.

ATTACHMENT 1: AGENDA

Monday, November 4, 2013	
11:30 – 12:45 PM	**LUNCH AND NETWORKING**
12:45 – 1:00 PM	**WELCOME & OPENING REMARKS** *Elliot Diringer, Executive Vice President, C2ES* *Otis Brown, Director, NOAA's CICS-NC* *Andy Hoffman, Holcim (US) Professor of Sustainable Enterprise, Director of the Erb Institute for Global Sustainable Enterprise, University of Michigan*
1:00 – 1:30 PM	**SESSION 1 - CLIMATE CONVERSATION** *THE STATE OF THE CLIMATE -* A discussion on how scientific assessments (e.g., the IPCC reports) connect to business decisions, and the broader need for public-private-academic partnerships to advance decision-support services. *Opening Speaker: Thomas Karl, Director, NOAA National Climatic Data Center* *ADVANCING CLIMATE ADAPTATION* – A discussion on how climate data/information is used for business decisions in the area of climate adaptation. *Keynote Guest Speaker: John Firth, CEO and Founder, Acclimatise*
1:30 – 1:40 PM	Discussion / Questions; *Moderator: Otis Brown, NOAA's CICS-NC*
1:40 – 2:15 PM	**SESSION 2 – CLIMATE DATA TO DECISIONS** Applications of weather and climate data for making decisions about resources and production inputs. *Speakers:* *Jim Chelius, Engineering Director - Corporate Planning, American Water* *Jeff Williams, Director, Climate Consulting, Entergy* *Jeff Hopkins, Principal Adviser, International Energy and Climate Policy, Rio Tinto*
2:15 – 2:30 PM	Discussion / Questions; *Moderator: Janet Peace, Vice President, Markets & Business Strategy, C2ES*
2:30 – 2:45 PM	**BREAK**
2:45 – 3:30 PM	**SESSION 3 – HOW DOES CLIMATE AFFECT BUSINESS? (PART 1)** Breakout groups (6-8 people) will brainstorm to identify ways that climate impacts can affect costs. *Discussion Leader: John Macomber, Senior Lecturer, Harvard Business School*

3:30 – 4:00 PM	**SESSION 4 – CLIMATE MODELS AS AN INFORMATION RESOURCE** Current state of climate models and projections: What do uncertainties, timescales, and scenarios mean for a decision maker? What are the available suites of monitoring and prediction products available from NOAA Climate Prediction Center? *Speaker: Wayne Higgins, Director, NOAA Climate Program Office*
4:00 – 4:10 PM	Discussion / Questions; *Moderator: Joe Casola, Staff Scientist, Director of Science and Impacts, C2ES*
4:10 – 4:25 PM	**SESSION 5 – INTEGRATED FEDERAL PERSPECTIVE ON CLIMATE INFORMATION** *Presenter: Tom Armstrong, Executive Director, USGCRP, Office of Science and Technology Policy, Office of the President*
4:25 – 4:35 PM	Discussion / Questions; *Moderator: Otis Brown, CICS-NC*
4:35 – 5:00 PM	**DAY 1 CLOSING REMARKS** *Moderator: Joe Casola and Janet Peace, C2ES*
5:45 – 6:45 PM	**NETWORKING RECEPTION** Location: District Chophouse – the Vault (509 7th Street NW)
6:45 – 9:00 PM	**DINNER AND CONVERSATION** Location: District Chophouse – The Vault (509 7th Street NW) (7:30PM) Ask a Scientist! Q&A session from the corporate attendees about climate science, climate data products, and decision-support tools. *Panelists: Joe Casola, C2ES;* *Amy Snover, Assistant Dean, Applied Research and Director of the Climate Impacts Group, Univ. of Washington;* *Otis Brown, NOAA's CICS-NC;* *Marina Timofeyeva, Physical Scientist, National Weather Service* *Moderator: Andrew Hoffman, University of Michigan*

Tuesday, November 5, 2013	
8:00 – 8:45 AM	**BREAKFAST NETWORKING**
8:45 – 9:00 AM	**WELCOME & OPENING REMARKS** *Janet Peace, C2ES* *Otis Brown, NOAA's CICS-NC*
9:00 – 10:00 AM	**SESSION 6 - HOW DOES CLIMATE AFFECT BUSINESS? (PART 2)** Breakout groups (6-8 people) will brainstorm to identify ways that climate impacts can affect revenues. *Discussion Leader: John Macomber, Harvard Business School*
10:00 – 10:10AM	**BREAK**
10:10 – 10:50AM	**SESSION 7 – EXAMPLES OF BEST PRACTICES** Best practices in corporate strategies for resilience planning. *Presenters: John Firth, Acclimatise; Michelle Colley, Senior Manager, ICF*
10:50 – 11:30AM	**SESSION 8 –EVALUATING CLIMATE RISKS AND OPPORTUNITIES** How can companies best evaluate climate risks and opportunities with respect to climate variability and climate change? How can they consider both acute impacts, and "slow creep" impacts? How can they think about near-term and long-term risks? *Presenter: Amy Snover, University of Washington*
11:30 – 11:45AM	**SESSION 9 - GROUP DISCUSSION / QUESTIONS AND ANSWERS** *Moderator: Janet Peace, C2ES*
11:45 – 12:45 PM	**LUNCH CONVERSATION and DISCUSSION** *Speaker: Remarks from Susan Ruffo, Deputy Associate Director for Climate Change Adaptation at the White House Council on Environmental Quality (CEQ)* *Moderator: Joe Casola, C2ES*
12:45 – 1:30 PM	**SESSION 10 – OPERATIONALIZING CONSIDERATIONS OF RISK AND OPPORTUNITIES** Diving deeper into specific examples, we will discuss the steps involved in assessing risks and opportunities, the types of data required at each step, the partnerships that can facilitate effective decisions. *Discussion Leaders: Amy Snover, University of Washington and Joe Casola, C2ES*

1:30 – 2:15PM	**SESSION 11 – GAPS AND NEEDS FOR ASSESSING RISK AND IDENTIFYING OPPORTUNITIES** In three groups (one for government/academia, one for consultants, and one for private sector end-users), we will identify the data and information needed to manage climate risks and identify opportunities. What are the challenges or gaps in resilience planning? Who can and should provide the data/information/tools? What key actions are needed to enable companies to gain value from the use of climate data, information, and tools? *Discussion Leaders: John Macomber (Industry), Andy Hoffman (Government/Academia), Joe Casola (Consulting)*
2:15 – 2:30 PM	**BREAK**
2:30 – 3:00 PM	**SESSION 12 - GROUP DISCUSSION** **ACTIONS TO SUPPORT PUBLIC-PRIVATE PARTNERSHIPS IN AN IDEAL WORLD** Discussion to allow groups to report back, with a focus on summarizing identifying gaps, the actions necessary to address these gaps, and the entities that are responsible. *Discussion Leader: Andy Hoffman, University of Michigan*
3:00 – 3:30 PM	**SESSION 13 – GROUP DISCUSSION** **ACTIONS TO SUPPORT PUBLIC-PRIVATE PARTNERSHIPS IN THE REAL WORLD** Panelists, from their perspective, will provide responses and reactions to the Session 12 Group Discussion, surrounding the assessment of climate risk and the identification of opportunities. In examining the key actions of the last session, panelists will discuss the appropriateness of the requirements identified in Session 12, and their capacity to be involved. *Discussion Leader: Andy Hoffman, University of Michigan*
3:30 – 3:45 PM	**CLOSING REMARKS and NEXT STEPS** *Janet Peace, C2ES* *Otis Brown, CICS-NC*

ATTACHMENT 2: ATTENDEE LIST

Company / Organization	Name	Title
Acclimatise	John Firth	CEO and Co-Founder
Acclimatise	Peter Adams	Consultant, Acclimatise
Alstom	James Ritchotte	Director, Federal Government Affairs
American Water	Jim Chelius	Engineering Director - Corporate Planning
Areva	Laura Clise	Director of External Communications & Corporate Citizenship
BASF	Mark Washko	Manager, Government Affairs
BASF	Curtis Zimmerman	Manager, Government Liaison, Innovation & Technology North America
Council of Great Lakes Industries	George Kuper	Chairman
DNV	Dick Bratcher	Senior Principal Consultant
DuPont	Sarah King	Manager, Climate and Sustainability
Entergy	Jeff Williams	Director, Climate Consulting
Exelon	Bill Brady	Director, Corporate Environmental Strategy
The Hartford	Jay Bruns	Vice President, Public Policy
Hitachi Consulting	Lauren Riley	Senior Manager, Environmental Sustainability Solutions
Hitachi Consulting	Julia Philpott	Senior Manager, Environmental Sustainability Solutions
ICF International	Michelle Colley	Senior Manager
Intel Corporation	Steve Harper	Global Director, Environment and Energy Policy
LMI	John Selman	Director of Business Development
PNM Resources	Jeanette Pablo	Director of Federal Affairs
Rio Tinto	Jeff Hopkins	Principal Adviser, International Energy and Climate Policy
Riverside	George Smith	Customer and Partner Solutions
World Bank / IFC	Alan Miller	IFC Climate Change Unit
OSTP/CEQ	Bina Venkataraman	Senior Advisor on Climate Chnage Innovation
NOAA	Thomas Karl	Director, NOAA National Climatic Data Center
NOAA	Wayne Higgins	Director, NOAA Climate Program Office
NOAA	Marina Timofeyeva	Physical Scientist, NOAA NWS Climate Services Division

Company / Organization	Name	Title
University of Michigan	Andrew Hoffman	Executive Forum Faculty Director, Erb Institute, University of Michigan
University of Washington	Amy Snover	Executive Forum Faculty; Assistant Dean, Applied Research; Director, Climate Impacts Group;College of the Environment, University of Washington
Harvard Business School	John Macomber	Executive Forum Faculty Senior Lecturer, Harvard Business School
C2ES	Joe Casola	Executive Forum Lead Staff Scientist, Director of Science and Impacts
C2ES	Janet Peace	Vice President, Markets & Business Strategy
C2ES	Steve Seidel	Senior Advisor
C2ES	Elliot Diringer	Executive Vice President
C2ES	Dan Huber	Director of Communications
NOAA CICS-NC	Otis Brown	Executive Forum Faculty Director, CICS-NC
NOAA CICS-NC	Jenny Dissen	Executive Forum Lead Director, Engagement and Outreach
NOAA CICS-NC	Paula Hennon	Deputy Director, NOAA Climate Assessment Technical Support Unit
NOAA CICS-MD	Fernando Miralles-Wilheim	Director, CICS; Professor University of Maryland
Ryerson University	Deborah de Lange	Assistant Professor of Global Management Studies, Ryerson University, Toronto, Canada and Business Strategy Advisor
OSTP/CEQ	Susan Ruffo	Deputy Associate Director for Climate Change Adaptation, White House Council on Environmental Quality
OSTP/CEQ	Fabien Laurier	Advisor for Climate Change Adaptation, White House Council on Environmental Quality
DOE	Craig Zamuda	Senior Policy Advisor, Office of Climate Change Policy and Technology Office of Policy and International Affairs
OSTP/USGCRP	Kathy Jacobs	Assistant Director for Climate Assessment and Adaptation (OSTP); Director of the National Climate Assessment
USGCRP	Emily Seyller	Inform Decisions & Adaptation Science Program Manager