

# Executive Roundtable

On Climate, Private Sector Engagement, and Strategic  
Forecasting



**INSTITUTE**  
*for* **GLOBAL**  
**ENVIRONMENTAL**  
**STRATEGIES**

## EXECUTIVE SUMMARY

The record-breaking extreme weather and climate events of 2011 and early 2012 highlight the growing need for environmental information. The National Oceanic and Atmospheric Administration (NOAA) has engaged stakeholders in a series of discussions on how the agency and the private sector together can meet growing demand of this information. Key developments in this area include a session at the 2011 *Open Science Conference* of the World Climate Research Programme that called for “actionable” climate information, review of the NOAA *Policy on Partnerships in the Provision of Environmental Information*, release of the NOAA Science Advisory Board’s (SAB) Climate Partnership Task Force (CPTF) report, and development of the Open Weather and Climate Services (OWCS) concept.

With this context in mind, the Institute for Global Environmental Strategies (IGES) convened the *Executive Roundtable on Climate, Private Sector Engagement, and Strategic Forecasting* in Asheville, N.C., on April 25-26, 2012. By leveraging results from the *Alternative Climate Normals and Impacts to the Energy Industry* workshop hosted by the National Climatic Data Center (NCDC) immediately preceding it, this meeting brought together a diverse group of leaders from the public, private, and academic sectors to consider recent developments in private sector engagement and address the following questions: What are the principles that define actionable climate information? What steps should NOAA take to facilitate the Climate Service Enterprise?

### Key themes

***Climate information is most useful and valuable when it is actionable – when it informs decisions.***

The right climate information product can help users plan ahead to reduce risk, adapt to changes in their environment, and identify cost-saving opportunities and efficiencies. Actionable climate information targets a variety of time and spatial scales and meets the following criteria: credibility, translatability and high present value.

***More strategic communication will sustain the Enterprise in the long-run.*** Economic indicators that look at the impact of climate may be crucial in communicating the importance of climate monitoring both to policymakers and to the general public. Mechanisms that improve users’ ability to communicate their needs will lead to better products and services and increase the ability of the Enterprise to satisfy an expanding user base. This, in turn, helps stakeholders identify and articulate the importance of climate information, giving added support for continued funding of the systems and programs that serve as the foundation of the entire Enterprise.

***Opportunities abound for government-industry-academic linkages.***

The development of actionable climate information requires a healthy Climate Services Enterprise that relies on the robust cooperation between the public and private sector. As companies expand into the climate arena, the private sector has a role to play in every segment of that value chain – from the development and operation of data collection systems, algorithms and models, to the development of products that play a critical decision-support role.

***The lessons of the Weather Enterprise lay the groundwork for a successful Climate Enterprise.*** Key principles for structuring the Climate Services Enterprise are: Using the Weather Enterprise as a model while carefully considering similarities and differences between weather and climate; maintaining a strong and open partnership between the public and private sector, particularly with regard to defining and respecting roles; and exerting leadership and developing a shared vision among the three parties.

This meeting was a success in bringing together leaders from the public, private and academic sectors to assess the latest thinking and pending issues related to the U.S. Climate Services Enterprise and to offer critical observations that will continue to inform developments in the community.

This research was conducted by Nancy Colleton and Laura Delgado López through the Cooperative Institute for Climate and Satellites—North Carolina (CICS-NC), under North Carolina State University Subaward 2009-1380-08.

## INTRODUCTION

The record-breaking extreme weather and climate events of 2011 and early 2012 highlight the growing need for environmental information. State and local governments and businesses across the nation are looking for a variety of data and information products to help mitigate and better manage risk. As a major source of this information, the National Oceanic and Atmospheric Administration (NOAA) is faced with an unparalleled challenge to meet the demands of this diverse and quickly expanding customer base. Not only must NOAA fulfill its responsibility to serve the nation's growing weather and climate information needs, it must also better understand priority information needs, do so in an environment of shrinking budgets and in a way that promotes economic opportunity for the U.S. private sector.

Aware of this challenge, NOAA has engaged stakeholders in a series of discussions to understand how the agency and the private sector together can meet growing demand of climate information. At a session of the October 2011 *Open Science Conference* of the World Climate Research Programme (WCRP), government, academic, and business leaders addressed climate science needs in service to society. A key recommendation that resulted from this discussion was for agencies such as NOAA to provide "actionable" climate information. The call for this information was particularly relevant to the energy and insurance sectors, which are developing long-term strategic plans that emphasize risk management and adaptation.

Climate Normals, which are an example of actionable climate information, have recently been a topic of discussion between climate scientists and users who feel that these three-decade averages of climatological variables may no longer be as relevant. Their concern stems from the historical data used to develop the Normals, which assume an unchanging climate and do not account for recent observed changes in weather and climate conditions. To address this issue, NOAA's National Climatic Data Center (NCDC) hosted the *Alternative Climate Normals and Impacts to the Energy Industry* workshop on April 24-25, 2012. [Figure 1]

On a broader scale, three other efforts are also underway to examine the private sector's role in providing climate information services: review of the NOAA *Policy on Partnerships in the Provision of Environmental Information*, release of the NOAA Science Advisory Board's (SAB) Climate Partnership Task Force's (CPTF) report, and development of the Open Weather and Climate Services (OWCS) concept. One of the key recommendations in the CPTF's final report (3-4) states:

NOAA and the private sector must agree on a strategy and a mechanism for structuring the climate enterprise. The planning process must be open, transparent, and designed to advance the enterprise for NOAA and the private sector. NOAA must provide the leadership to initiate this process.

With this context in mind, the Institute for Global Environmental Strategies (IGES) convened the *Executive Roundtable on Climate, Private Sector Engagement, and Strategic Forecasting* in Asheville, N.C., on April 25-26, 2012. By leveraging results from the Climate Normals workshop, this meeting brought together a diverse group of leaders from the public, private, and academic sectors to address the following questions: *What are the principles that define actionable climate information? What steps should NOAA take to facilitate the Climate Services Enterprise? What principles will lead to the success of the Enterprise?*

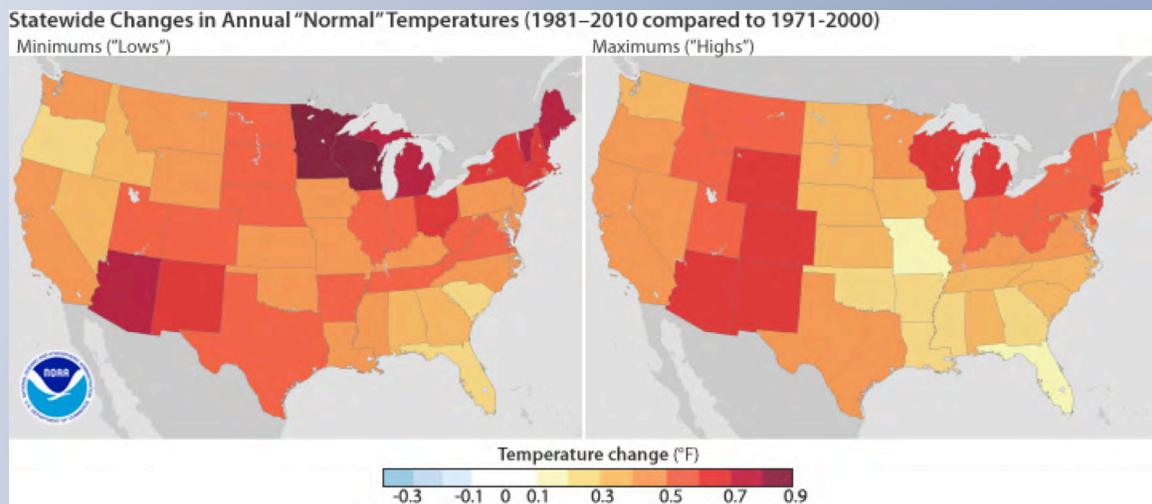
This work is part of IGES' *Stakeholder Engagement to Better Understand Climate Information Needs* project, conducted under Sub-Award No. 2009-1380-08 of the Cooperative Institute for Climate and Satellites (CICS) at North Carolina State University.

### Figure 1: Alternative Climate Normals and Impacts to the Energy Industry

On April 24-25, 2012, immediately preceding the Executive Roundtable, NCDC convened the *Alternative Climate Normals and Impacts to the Energy Industry* workshop. The goal of the workshop was to review the state of the knowledge regarding existing and new “Normal” calculations and identify the needs of the energy sector to utilize this data for improved business operations and efficiency, risk-management and long-term forecasting.

NCDC Product Development Branch Chief Dr. Russell Vose and CICS-NC Director Dr. Otis Brown briefed the group on the highlights of the workshop. The observations below are directly relevant to the issues of how to structure the Climate Services Enterprise and how to improve public-private interaction in the provision of these services:

- The 30-year Normals continue being effective for long-term planning. At the same time, many decisions are made on a shorter, often hourly, basis. Products with shorter time scales – monthly, daily, weekly – would therefore be useful.
- The community appreciates efforts to homogenize data and values the “gold standard” in data quality that NCDC is known to provide. Better understanding of how NCDC addresses biases in the data would be appreciated.
- Opportunities exist for the private sector to provide some of these services. One concern is the degree of confidence in the data/product when the source is non-governmental.
- NOAA is expected to continue providing basic data sets and services.



*Above: Statewide changes in annual "normal temperatures" in 1981 – 2010, when compared to 1971 - 2000. Credit: NOAA*

## RECENT DEVELOPMENTS IN PRIVATE SECTOR ENGAGEMENT

As part of its *Stakeholder Engagement to Better Understand Climate Information Needs* project, IGES is conducting an assessment of private sector engagement in the provision of climate services. IGES' Earth Observations Associate Laura Delgado López gave Roundtable participants a presentation on key observations resulting from this research, which helped set the stage for the group's discussions.

In the existing model of public-private engagement, NOAA, a government-funded agency, provides basic data and information to the private sector for the development of tailored environmental information services and products. This model has been continually tested in terms of weather and ongoing discussions consider whether it is appropriate for the development and delivery of climate services as well.

Delgado López explained that although facing several challenges, particularly in light of budget constraints, two important elements suggest that this is the appropriate model for structuring the Climate Services Enterprise: existing policy and practice, and the success of the Weather Enterprise. Experts interviewed agree that even though some issues need to be addressed (for example, defining roles and responsibilities) there is no need to reinvent the relationship between NOAA and the private sector.

The following key developments have involved discussions of how to improve different aspects of this public-private engagement in support of the Climate Services Enterprise:

- **NOAA Partnership Policy<sup>1</sup>** – This policy was developed in response to the National Research Council's (NRC) 2003 *Fair Weather: Effective Partnerships in Weather and Climate Services* report. To avoid stifling innovation and promoting the success of the Environmental Services Enterprise, the report called for a replacement of NOAA's 1991 policy, into one that "defines processes for making decision on products, technologies, and services, rather than rigidly defining the roles of the NWS and the private sector." The policy acknowledges the benefits of the private sector and academia's growing involvement in the provision of environmental services. It states that: "The nation benefits from government information disseminated both by Federal agencies and by diverse nonfederal parties, including commercial and not-for-profit entities" and commits NOAA to foster the growth of the Enterprise "to serve the public interest and the nation's economy." Although it considers some tension to be inevitable, it establishes principles such as consultation, equity, and recognition of roles of others to address this tension. It was established in 2006 and it is being reviewed by the NOAA SAB's Environmental Information Services Working Group (EISWG), through the American Meteorological Society (AMS), in 2012.
- **Climate Partnership Task Force (CPTF)<sup>2</sup>** – The CPTF was established by the NOAA SAB's Climate Working Group and EISWG to develop a model for public-private sector collaboration. The CPTF's final report was released in October 2011 and it proposes the following theme: "NOAA will engage and empower the private sector as a partner in creating climate products and services

<sup>1</sup> See "Policy on Partnerships in the Provision of Environmental Information," NOAA, online: <http://www.noaa.gov/partnershippolicy/>.

<sup>2</sup> See *A Vision and Model for NOAA and Private Sector Collaboration in a National Climate Services Enterprise*, NOAA Science Advisory Board (October 2011), online: [http://www.sab.noaa.gov/Reports/CPTF\\_RPT\\_FINAL.pdf](http://www.sab.noaa.gov/Reports/CPTF_RPT_FINAL.pdf)

and delivering them to the nation.” The report concludes that open-access to publicly funded data, sustained collaboration and building on the Weather Enterprise’s success are critical for the success of the Climate Services Enterprise.

- **Open Weather and Climate Services (OWCS)**<sup>3</sup> – According to a white paper prepared by EISWG, the Enterprise’s access to NOAA data and to the design/development process of new technologies is one of the main obstacles to realizing the full value of investment. In this December 2011 document, the OWCS concept was proposed to promote an open access data policy and symbiotic development of hardware and software technologies. The adoption of this concept has been the topic of discussion at high levels of NOAA leadership and among the academic and private sectors as a way to improve the ability of the Enterprise to meet both weather and climate needs and ensure NOAA’s mission success.
- **American Meteorological Society (AMS)** – The 2011 AMS Summer Community Meeting, entitled “Building a Stronger Weather and Climate Enterprise: Keeping the Economy Moving,” focused on critical data needs and evaluating the economic impact of meteorological services to society. Predominantly focused on weather, the discussion led to several conclusions that were captured in summary materials distributed after the meeting, among these: the demand for meteorological information will only continue to grow; the enterprise is working well to meet demand. Also of note is the finding that the basis of the enterprise is made up of NOAA’s fundamental meteorological data and foundational forecasts and that a close “and symbiotic relationship” between NOAA and its partners “is allowing the most effective and efficient deliver of meteorological information in the world.”

As a continuation of this effort, the AMS Commission on the Weather and Climate Enterprise (CWCE) will devote a portion of its 2012 Summer Community Meeting to “The State of the Enterprise.” The goal is to produce an initial report on the state of the weather, water and climate Enterprise by evaluating all of its components. As part of this assessment, the CWCE has reached out to the private sector for input on a variety of issues such as companies’ relationship with other sectors of the Enterprise, and their ability to serve customers and the nation.

It is also of note that the OWCS will be topic of discussion during the AMS Summer Meeting and that a draft policy statement on Climate Services has been circulating and will be made public soon.

Review of these developments in addition to interviews with experts suggest the following observations:

- The NOAA partnership policy is sufficient to guide the public-private climate relationship.
- Open dialogue and collaboration between NOAA and the private sector is key moving forward.
- Though coupled in practice and policy, similarities and differences exist between weather and climate. One key difference pertains to different scopes in terms of timescale: where weather applies to a range of up to two weeks, climate looks both before and beyond that, considering much broader timescales. The way that the private and public sector interact to provide these different kinds of services may vary so differences of this nature may be critical to determine policy/practice.
- Pending issues include improving user education, adopting different ways to talk about climate/climate change to a variety of audiences, and defining public-private roles.

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<sup>3</sup> See *Towards an Open Weather and Climate Services*, NOAA Science Advisory Board (23 December 2011), online: [http://www.sab.noaa.gov/Doc/Towards-Open-Weather-and-Climate-Services-report-and-transmittal\\_12\\_23\\_11.pdf](http://www.sab.noaa.gov/Doc/Towards-Open-Weather-and-Climate-Services-report-and-transmittal_12_23_11.pdf)

## KEY THEMES

The following themes resonated throughout the Roundtable. The agenda as well as the available presentations of the speakers are available at the *Stakeholder Engagement to Better Understand Climate Information Needs* page of the IGES website: <http://strategies.org/environmental-information/stakeholder-engagement-climate-information/executive-roundtable/>

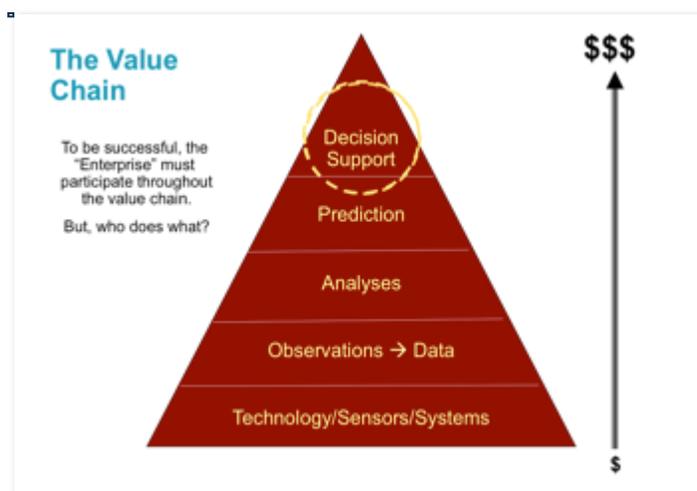
A list of workshop participants is included in Appendix A.

### Climate Information: Actionable and Valuable

*“I believe that climate information can be a lot more useful than it is right now.”*  
 – Mark Brooks, Assistant Director, State Climate Office of North Carolina

Climate information is most useful and valuable when it helps inform decisions [Figure 2]. As Vaisala’s Chief Science Officer Dr. Walt Dabberdt emphasized “data for data’s sake has virtually no economic value.”

Users are clamoring for information that helps them make decisions for their medium and long-term planning towards goals of adaptation and resiliency. The right climate information product can help them plan ahead not only to reduce risk and adapt to changes in their environment, but also to identify opportunities and efficiencies that save costs down the road. In fact, while many users increasingly realize the impact of climate on their business models and activities, this need is not always linked to a concern for climate change. For example, a quarterly earning report for Duke Energy Corporation specifically linked mild temperatures and extreme weather as the main causes of a 33% drop in earnings.<sup>4</sup>



*Figure 2: This pyramid represents the value chain of environmental information, with monetary value increasing at the top: information is the most valuable when it serves as a decision-support tool. Credit: Walt Dabberdt, Vaisala Group*

To be able to support decision-making – and therefore be “actionable” – climate information must meet the following criteria:

- **Credibility:** *Where are the data coming from? Are they trust-worthy and transparent?*

<sup>4</sup> Mild temperatures in North Carolina, South Carolina, Kentucky, Indiana and Ohio during this past fall and early winter reduced electricity demand, while storm damage increased maintenance costs. See Jonathan Fahey, “Duke energy earnings fall on mild weather,” (16 February 2012), *Associated Press*. Last accessed 5 July 2012 from: <http://news.yahoo.com/duke-energy-earnings-fall-mild-weather-123523085.html>

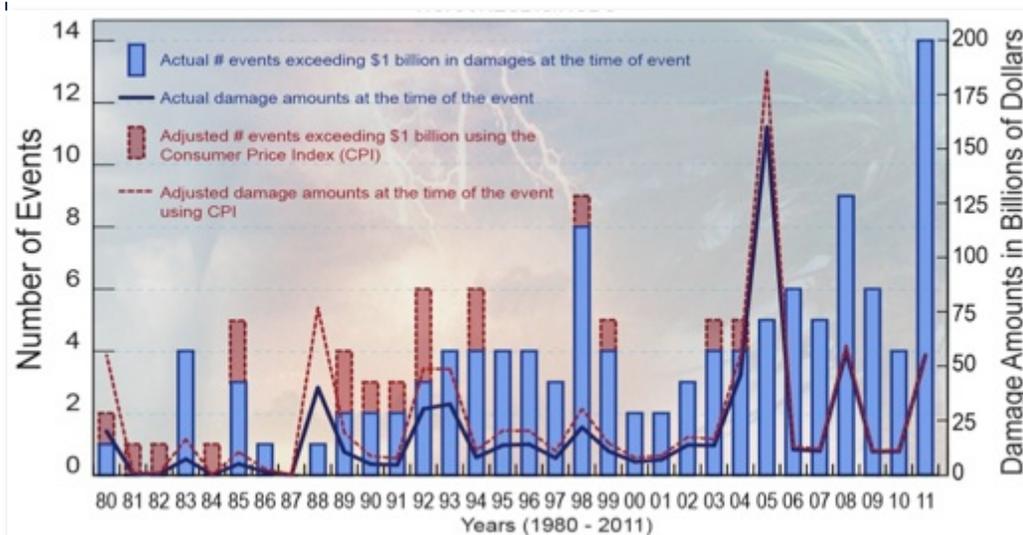
- **Translatability:** *How does this information affect me/my business? Does it inform the kinds of decisions that I need to make? Is it put in context for my unique scenario?*
- **High Present Value:** *What are the benefits of this information? What are the incentives of taking action? What is the cost of not acting now?*

As these principles suggest, actionable information products and services must be able to address demands with shorter time/spatial resolution that align to the broad range of decisions that decision makers make in a routine basis. For example, the North Carolina State Climate Office developed a “peanut disease advisory system” that shows peanut growers their level of risk and helps them determine when to use expensive fungicides. When compared with the routine spraying of the fungicide that does not take into account risk levels or climate information, this system has helped farms save an average of \$3-4 million a year statewide.

Considering this and other examples, Dr. Antonio Busalacchi, director and professor of the Earth System Science Interdisciplinary Center (ESSIC) at the University of Maryland, summarized the point: “One size clearly does not fit all.” Instead, actionable climate information requires the integration of new and diverse data sources to target a variety of time and spatial scales and inform a myriad of decisions.

## Growing Demand and Meeting the Communication Challenge

*“We may be underestimating the impact of climate on the economy.”*  
 – *Leonard Pietrafesa, Associate Dean Emeritus and Professor Emeritus, North Carolina State University; Commissioner, AMS Commission on the Weather and Climate Enterprise*



*Figure 3. Graph of NOAA's billion-dollar climate and weather disasters. The very last column depicts the new record of 14 events, set in 2011.*

Last year the United States experienced a record 14 extreme weather and climate disasters exceeding \$1 billion in damages, which amounted to more than \$52 billion in losses [Figure 3]. Despite noting that 2012 began with an early billion-dollar disaster, NCDC Director Thomas Karl explained that 2011 numbers are still being tallied.

NOAA's billion-dollar measure<sup>5</sup> helps stakeholders

<sup>5</sup> “Billion Dollar Weather/Climate Disasters,” NOAA/NCDC, <http://www.ncdc.noaa.gov/billions/>

communicate the importance of the nation's monitoring capabilities to reduce the impacts of extreme events. In addition, a recent National Center for Atmospheric Research study<sup>6</sup> concluded that the impact of routine weather on the economy could be as much as 3.4% of U.S. gross domestic product, or about \$485 billion annually. While both figures suggest important implications for the economic impact of climate and climate change, there is a lack of indicators that capture the specific impact of climate-related events, particularly those that take place on longer timescales. This is of concern because while the general public readily knows how weather affects them, climate may seem irrelevant to their lives and they may ignore that its impacts on the economy could be even more profound than routine variations in weather.

Economic indicators that look at the impact of climate may be crucial in communicating the importance of climate monitoring both to policymakers and to the general public. This faces a number of challenges, nevertheless, some of which were discussed during a recent workshop convened by the IEEE and other entities such as the Group on Earth Observations (GEO), and NASA. The *Workshop on Defining, Measuring, and Communicating the Socioeconomic Benefits of Geospatial Information* aimed to engage experts in a conversation about how to lend more rigor to economic analyses of the value of Earth observations (EO) data and information. In introducing the event, Resources for the Future's Dr. Molly Macauley noted that recent work has focused on describing the benefits of this information, with little emphasis on quantification. She argued that improved measures could help give policymakers the tools to weigh the value of EO programs and support arguments for increased budgets. In the discussion that followed some questioned whether coming up with a single figure of economic value, such as a return on investment (ROI), was possible or even desirable. George Washington University's Dr. Henry Hertzfeld, for example, made the following observations: (1) Varying time frames impact the assessment greatly, a point that is particularly relevant when considering climate since this information may not be used until years in the future, (2) government programs derive benefits, not profit, that are spread over different uses and timescales, so a single figure may not be feasible, and (3) there should be a focus on impacts and benefits, not costs. He concluded on this last point by saying that Earth observations are "very costly," but not less useful and valuable as a result. This discussion highlighted growing attention on how to measure the true value of environmental information, an issue that should be a priority for NOAA and NCDC as it respects to climate services.

In the meantime, growing numbers of businesses are realizing the importance of climate information in their long-term strategic outlook. The insurance and reinsurance sectors in particular have been very vocal in communicating the costs resulting from natural disasters associated with climate change. For example, Swiss Reinsurance Company Ltd. states that the average annual weather-related insurance industry loss in the U.S. was \$3 billion a year in the 1980s, a figure that rose to an average of \$20 billion by the end of the past decade.<sup>7</sup> With respect to NCDC efforts to reach out to this and other sectors, NCDC's Tamara Houston described the Center's engagement activities with 12 climate-sensitive sectors of the economy, including: transportation, national security, health, and civil infrastructure. Their activities seek to maintain a continuing dialogue between NCDC scientists and users, serving both as an outlet for NOAA to communicate and as a way to receive input directly from the users.

With a quickly expanding user base, NOAA and the private sector must be able to develop ways to meet emerging needs. Yet even as the importance of climate information to inform the decisions of individuals, businesses and governments grows prevalent, budgetary cuts and policy instability with regard to climate monitoring poses a threat to continuing and improving climate services. Without adequately and consistently funding observing systems and programs that seek to improve data quality and archiving

<sup>6</sup> "Economic cost of weather may total \$485 billion in U.S.," AtmosNews (21 June 2011), online: <https://www2.ucar.edu/atmosnews/news/4810/economic-cost-weather-may-total-485-billion-us>

<sup>7</sup> "Insurers See Growing Risks and Costs from Climate Change," Insurancenews.net (2 March 2012), online: <http://insurancenewsnet.com/article.aspx?id=332675>

processes, for example, the ability of the Enterprise to meet existing and continuing needs will be compromised. This situation highlights the importance of improving communication to two broad groups of audiences: policymakers and the general public, and the user community. Listed below are some of the persisting communication challenges that were identified in the discussion:

### Public Communication Challenges

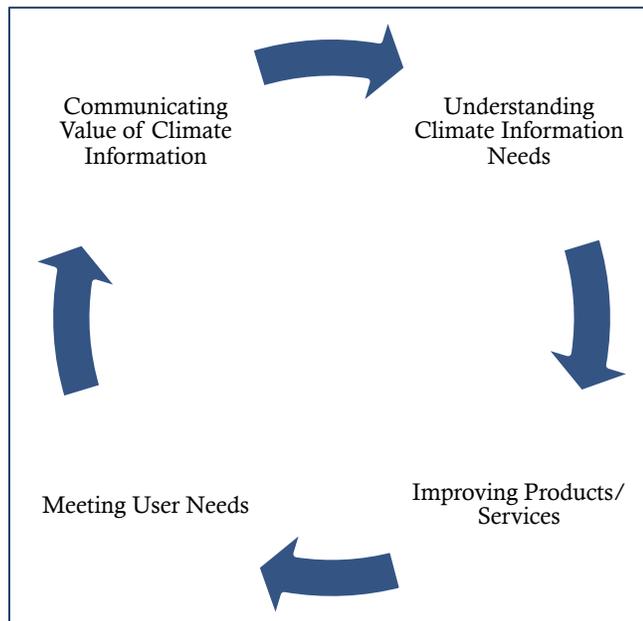
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- Connecting the dots for policymakers: from initial investments to mission success and economic opportunities.
  - Engaging the general public in ways that articulate how climate and climate change impact their lives. This includes taking advantage of events like droughts and heat waves to communicate longer-term impacts.
  - Communicating the economic value of climate, both in terms of risks and opportunities.
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### User Communication Challenges:

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- Advising users on what data and information products exist, how can they be accessed, and how can they be used.
  - Engaging different communities to understand different sectors' needs in terms of spatial and temporal scales, delivery mechanisms, etc., in order to identify NOAA and private sector products and services that can meet those needs
- 



Improved communication can help sustain the Enterprise in the long run by allowing it to identify, meet and take advantage of users' evolving needs. As depicted in Figure 4, mechanisms that help users communicate their needs will lead to improved products and services and increase the ability of the Enterprise to satisfy the expanding user base. This, in turn, helps stakeholders identify and articulate the importance of climate information, giving added support for continued funding of the systems and programs that serve as the foundation of the nation's climate information services.

*Figure 4.*

## Opportunities for Government-Industry-Academic Linkages

*“[In terms of] Asheville and our strategic initiatives, we are betting on climate.”  
– Ben Teague, Senior Vice President of Economic Development, The Asheville Chamber of Commerce; Executive Director, Economic Development Coalition*

The development of actionable climate information products requires a healthy Climate Services Enterprise that depends on robust cooperation between the public and private sectors. Cooperation between both sides is the result of long-standing policy and practice, which has been successfully demonstrated in the development and delivery of weather services. NOAA’s engagement with the private sector is guided by principles established by NOAA’s Partnership Policy. Although the policy does not make a distinction between weather and climate, the issue at hand pertains specifically to translating this engagement to enable similar successes in the provision of climate services.

Fortunately, the private sector – which includes actors that are already involved in the provision of both weather and climate services – is not only interested in expanding to this area but is uniquely positioned to thrive in doing so. In a context where budget constraints force NOAA to focus on a limited set of priorities and reinforce the agency’s commitment to support economic development, opportunities exist for all three “legs of the stool,” government, industry and academia, to play a critical role in the emerging Climate Services Enterprise. Furthermore, in these early stages, entrepreneurship in both the public and private sectors will play a critical role in the Enterprise’s growth and evolution.

Whereas in the traditional Weather Enterprise model, the private sector mainly contributed to informing the public about weather-related risks [Figure 5], growth in this sector in the past few years has allowed private activities to expand. Companies now play a larger role in the collection and analysis of weather information. As it expands into the climate arena, the private sector has a role to play in every segment of the climate services value chain – from the development and operation of data collection systems, algorithms and models, to the development of products that play a critical decision-support role. For example, CSC announced in June the availability of a product called ClimatEdge which leverages data from NOAA and other government agencies to develop data sets that help companies manage climate-related risks.<sup>8</sup>



<sup>8</sup> “CSC Announces Availability of ClimatEdge™ Risk Reports Derived from Government Big Data Sources,” *Market Watch* (4 June 2012), online: <http://www.marketwatch.com/story/csc-announces-availability-of-climatedgetm-risk-reports-derived-from-government-big-data-sources-2012-06-04>

This kind of evolution may spur innovation in all three “legs of the stool.” For example, it may require the integration of new, non-traditional data sources such as crowd-sourced data, collected by several individuals or communities from a variety of platforms, such as cellphones, which have proven an important source for the disaster management community.

## Principles for a Successful Climate Enterprise

*“[With the Weather Enterprise as a model] the Climate Enterprise can start way ahead of the game.”  
– Robert Marshall, President & CEO, Earth Networks*

The successful interaction of the academic, private and public sector in the Climate Services Enterprise requires ongoing discussions about how to structure engagement between these actors. Of particular concern is ensuring that innovation is enabled from both sides in a way that does not engender competition and mistrust between the parties.

The group identified the following key principles that will contribute to the success of the Climate Services Enterprise:

### Weather Enterprise as a model

Weather and climate data form a cycle where both sets of data are used to feed into and improve forecasts and models. In the past, weather and climate have been coupled in practice and policy even though the focus has been on enabling the provision of weather services. As the Weather Enterprise has evolved and thrived in the last few decades, it represents a model of success for the Climate Services Enterprise to follow. Challenges that have been overcome in the past, such as the issues that led to the revision of the partnership policy in 2006, will yield lessons that will contribute greatly to the climate case.

Nevertheless, this assumption does not negate important differences between the two that must be taken into account. Differences between weather and climate services stem from a variety of factors, such as timeline and scope of the services developed, social and political attitudes toward the concepts, etc. Figure 6, on the following page, compares sector maturity by looking at specific variables such as entry points and user requirements.

	<b>Weather</b>	<b>Climate</b>
<b>Business requirements</b>	Well-defined	Varies by sector
<b>User education</b>	Advanced	Varies by sector
<b>Scope of data</b>	Short-term (0 hours – 2 weeks)	Historical, trend analysis, short term (2 weeks – 1 year), long-term (intraseasonal, interseasonal, 1 year+)
<b>Observing system/operators</b>	Government, growing business market	Government, academia
<b>Distribution mechanism</b>	Government, established business market	Government, academia, research, emerging business market
<b>Public-private roles</b>	Well-defined, continually tested	Not well communicated, untested
<b>Entry points</b>	Well-defined	Undefined, untested

*Figure 6: This table provides a comparison of the degree of maturity between the weather and climate sectors. Credit: IGES*

The Weather Enterprise model is a template for success that could help deliver increased return on investment and help NOAA meet its mission through the delivery of critical climate information services. The culture of engagement between the sectors is an important baseline for deciding how to address differences between weather and climate that may impact how the Enterprise is structured.

### **Strong and open partnership between public and private sector**

One of the biggest sources of tension between the actors arises between the public and private sector as the private sector begins to assume even greater roles in the climate information value chain. Participants discussed examples of products tailored to different end users and expressed their views on where to draw the line that separates the public and the private sector sphere. Although these distinctions have been well-tested in terms of weather products and services, the relative immaturity of the climate services market produces uncertainty about how best to understand and meet user needs without leading to unintentional competition. Managing these tensions while enabling innovation and efficiencies will depend on well-defined roles and continued, open engagement. The kind of processes that have been established in the Weather Enterprise, such as the process that NOAA has established to communicate with the private sector when considering retiring a product, will need to be laid out in terms of climate services as well. Proposals like the OWCS concept seek to address this issue of openness and increase the likelihood that the private sector is well positioned to take advantage of the economic opportunities NOAA data represent.

As this and other issues are being addressed, NOAA must better communicate its willingness to cooperate. Goodwill and transparency will be key in identifying roles and responsibilities moving forward. Miglarese Consulting's Anne Miglarese stressed that understanding the sensitivities and risks of both sides will be important in defining and adhering to agreed-to roles. She noted that lacking this definition represents risks to the Enterprise: "it's like quicksand if those roles move continuously," she said.

## **Vision and leadership**

Maintaining open dialogue with all stakeholders, respecting each other's roles while evolving in a way that seeks opportunities within the Enterprise will require leadership and a shared vision. According to Miglarese, a step in the right direction is for NOAA to determine a vision for the next ten years and a short-term roadmap that helps guide its engagement with the other players to address the issues identified here.

## CONCLUSION

The *Executive Roundtable on Climate, Private Sector Engagement, and Strategic Forecasting* was a success in bringing together leaders from the public, private and academic sectors to assess the latest thinking and pending issues related to the U.S. Climate Services Enterprise.

The themes outlined in the previous pages highlight the benefits of an open dialogue between representatives of all three sectors to identify opportunities and solutions for persisting challenges.

These suggest the following conclusions:

- Improving communication to the general public is of benefit to the entire emerging Enterprise. The approach should seek to emphasize how climate impacts individuals, local communities and businesses, and the value of climate information.
- Better engagement from NOAA's part to communicate about its products and how to use them as well as the methods and standards it employs to produce and deliver high quality data will help educate users about how to integrate climate information tools in their decision making.
- Credible data is absolutely essential for both climate service providers and for users.
- NOAA is uniquely positioned and committed to continue acting as a source and steward of climate data.
- Numerous opportunities exist for improved engagement between the public and private sectors in the provision of climate services — from identifying user needs across various economic sectors to adding value to climate data in support of effective decision making.
- While differences in sector maturity, education and other distinctions will need to be taken into account, there is value in adopting the Weather Enterprise as a model to structure the Climate Services Enterprise.
- The long-term success of the Climate Enterprise will depend on leadership, a shared vision and continued, open dialogue between the private, public, and academic sectors.

In the short term, NOAA will review its partnership policy, examine the benefits of implementing the Open Weather and Climate Services concept and receive input from discussions on the health of the Enterprise and next steps through AMS. The observations identified in this report will be instrumental in these discussions moving forward.

## APPENDIX A: ROUNDTABLE PARTICIPANTS

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