

EXECUTIVE OFFICE OF THE PRESIDENT  
**PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY**  
 WASHINGTON, D.C. 20502

November 2015

Dear Mr. President:

In March 2015, you asked your Council of Advisors on Science and Technology (PCAST) to identify ways in which the Administration can assist the private sector in coping with climate changes already underway and preparing for those to come. This letter report provides our response and, in so doing, builds on the March 2013 PCAST letter report on climate change.<sup>1</sup>

**Background**

Most Federal initiatives to support action on climate change fit into a matrix of four quadrants, defined by the types of activities (mitigation and adaptation) and the locus of the actors undertaking them (public sector and private sector).<sup>a</sup> See the table below.

Actors Activities	Public Sector	Private Sector
<b>Mitigation</b>	Federal clean-energy research and development, Executive Order 13693, <sup>2</sup> Presidential Memorandum on Federal Energy Management <sup>3</sup>	Clean Power Plan, <sup>4</sup> building and vehicle-efficiency standards, American Business Act on Climate Pledge <sup>5</sup>
<b>Adaptation</b>	EO 13653, <sup>6</sup> Drought Resilience Partnership, <sup>7</sup> EO 13690, <sup>8</sup> Climate Data Initiative, <sup>9</sup> Climate Resilience Toolkit, <sup>10</sup> Task Force on Climate Preparedness and Resilience, <sup>11</sup> building and infrastructure standards <sup>12</sup>	Climate Data Initiative, Climate Resilience Toolkit

Although the entries are illustrative rather than comprehensive, the paucity of entries in the fourth quadrant—private-sector adaptation—reflects a real deficit. Your Administration’s initiatives have been focused to a much greater extent on the other three categories—mitigation-related activities in the public and private sectors, and adaptation-related activities in the public sector.

In response to your request of March 2015 to look at options to do more to support the ability of the private sector to prepare for and respond to the impacts of climate change—including extreme events—on business operations, supply chains, and long-term customer needs, PCAST focused

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<sup>a</sup> We here use “adaptation” as shorthand for adaptation, preparedness, and resilience. The sectoral distinction is based on who takes the mitigation or adaptation action, not on where the relevant policy was formulated. This simplified taxonomy leaves out activities that cut across mitigation and adaptation, such as the Climate Education and Literacy Initiative ([www.whitehouse.gov/sites/default/files/microsites/ostp/climateed-dec-3-2014.pdf](http://www.whitehouse.gov/sites/default/files/microsites/ostp/climateed-dec-3-2014.pdf)).

initially on the agriculture, water, and energy sectors. These sectors present particularly compelling needs and opportunities for near-to-medium-term action. Many of the findings and recommendations, however, also apply more broadly across the economy.

In the course of this effort, PCAST hosted extensive conversations with the private sector and government agencies, reviewed many reports and peer-reviewed papers, participated in several workshops with stakeholder groups, and held its own workshop. That workshop engaged representatives from thirty-five stakeholder groups, including individuals from the agriculture, water, energy, and insurance sectors; Federal agencies (including members of the interagency Council on Climate Preparedness and Resilience<sup>b</sup>); and non-governmental organizations representing both the public and private sectors. Those interactions informed the three key findings and six recommendations that follow.

## Findings

Three key findings emerged from PCAST's investigation of private-sector activities relating to climate change. They are:

- (1) Adaptation to climate changes that affect continuity of operations, supply chains, and the integrity of facilities are undervalued in the private sector.<sup>c</sup> Companies that do attend to adaptation focus primarily on near-term changes such as increased extreme-weather events (e.g., flooding, drought), where there is a greater understanding of the effect on business execution and financial performance, and not on the need for adaptation to the long-term impacts of climate change (e.g., sea-level rise, changing availability of feedstocks). With some notable exceptions, there is little activity in the private sector aimed at adapting to long-term climate-induced disruptions to supply chains and business continuity. Few major companies have incorporated climate data or modeling into long-term decision-making or otherwise taken steps to address these risks; and smaller and medium-sized enterprises have less capacity to understand and address risks of this kind. The near-term nature of business focus can play a role in preventing the private sector from looking at longer-term climate effects and adaptation measures. Better communication is needed about the long-term risks climate change poses and the adaptation steps that can be taken to minimize economic, social, and ecological costs.
- (2) Companies rarely report metrics for measuring the success of climate-adaptation initiatives. Best practices or lessons learned from dealing with climate variability and climate change are not widely available or shared. Work is needed to define and reach consensus on the most appropriate metrics to develop and track.
- (3) Relevant tools and information from the Federal Government can be difficult to locate and use. Company executives consulted by PCAST were largely unaware of existing Federal data and tools. Additionally, some noted that data would need to be more precisely tailored to specific users' needs, for example by sector, geography, or by the capability and experience of the user. There was an overwhelming call for an easy-to-use, single entry

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<sup>b</sup> The interagency Council on Climate Preparedness and Resilience was established by EO 13653 and is co-chaired by the Office of Science and Technology Policy (OSTP), the Office of Management and Budget (OMB), the National Security Council (NSC), and the Council on Environmental Quality (CEQ). The Council includes five working groups, focused on: agency adaptation planning, data and tools, infrastructure resilience, climate and natural resources, and international adaptation.

<sup>c</sup> One insurance executive explained that climate and an aging population are the biggest source of risk that generate liability for their industry.

point for obtaining usable data along with tools and methods to convert such data into actionable information. As well, in the future the private sector would like to participate in creating tailored information.

Finally, we observe that an opportunity exists to improve communications and understanding between the public and private sectors about the state of climate science, the risks posed by climate change, the complex and critical role public and private insurance and insurance regulations play in dealing with the impacts of climate-related events, and the actions that can be taken to improve adaptation. An element of this communication needs to be improved appreciation by the Federal Government of the drivers of decision making and time frames regarding risk analysis used by the private sector as it talks about and addresses adaptation. An intentional benefit of the public-private partnerships that form the basis of several of the recommendations below is to help foster this dialogue.

Apart from select actions taken by some companies focused on extreme-weather events—and the work of a very few companies to prepare more broadly for a changing climate—the possibilities for the private sector to prepare for and adapt to climate change remain largely unexploited. The Federal Government can do more to motivate and facilitate such activity.

## **Recommendations**

PCAST has developed recommendations in six areas that, when taken together, would help the Federal Government to catalyze and support private-sector efforts in adaptation.

***Recommendation 1: Educate and communicate*** – The interagency Council on Climate Preparedness and Resilience should develop and implement a robust strategy for private-sector education and communication that:

- (a) explains the critical need for adaptation planning and action by companies and other organizations;
- (b) brings attention to the fact that the nature of such efforts will often extend well beyond the normal near-term planning horizon of most private-sector participants; and
- (c) integrates private-sector efforts with the adaptation work underway in the public sector.

The Council should actively engage the private sector as an integral part of this effort.

***Recommendation 2: Enhance adaptation-science research and technology development and demonstration*** – The National Global Change Research Plan of 2012-2021 is a comprehensive plan covering climate-related research activities across the U.S. Government.<sup>13</sup> The update to that plan, underway at the time of this writing, should incorporate the activities of additional Federal partners, such as the Department of Homeland Security (DHS), which includes the Federal Emergency Management Agency (FEMA), and should “facilitate analyses of multi-sectoral effects of global change, such as linked effects on water, agriculture, energy, and health.”<sup>14</sup> The final plan should include:

- (a) development of a research strategy for adaptation;
- (b) identification of research themes related to the application of scientific modeling to enable better understanding of the advantages and limitations of various adaptation responses, as well as ways the processes and practices can be used to judge the efficiency and efficacy of long-term adaptation actions; and

- (c) identification of “metrics for success” that would enable the public and private sectors to measure progress to goals as well as, for example, the return on investments related to such activities.

The interagency Council on Preparedness and Resilience, in consultation with the private sector, should create an interagency working group to develop a comprehensive adaptation and resilience technology, development, and demonstration plan. By September 30, 2016, the Council should present a detailed roadmap to foster the development and demonstration of technologies needed to meet adaptation needs in both the public and private sectors.

***Recommendation 3: Close the information gap*** – The Subcommittee on Global Change Research of the National Science and Technology Council’s Committee on Environment, Natural Resources, and Sustainability,<sup>15</sup> in consultation with private-sector participants and others who have a stake in adaptation activities, should:

- (a) take charge of improving the availability of, access to, and usability of the array of climate data, models (including ensuring models are at appropriate geographic scales), best practices, case studies, and information related to Federal Government programs and resources that will accelerate private-sector adaptation decision-making and actions; and
- (b) review existing information programs and resources, such as the Climate Data Initiative and the Climate Resilience Toolkit, for sufficiency to support private-sector adaptation activities.

The Subcommittee should be responsive to the FY 2017 R&D Priorities Memo issued by the Office of Management and Budget (OMB) and the Office of Science and Technology Policy (OSTP).<sup>16</sup> That Memo contained guidance that participating agencies should “prioritize activities that foster the development and use of actionable data, information, and related tools needed to prepare for and reduce climate-related risks and should prioritize investments that support technical assistance for community climate-preparedness efforts.”

***Recommendation 4: Unlock investment capital*** – The National Economic Council (NEC), with OSTP, OMB, and the Department of the Treasury, and in consultation with the private sector, should establish a task force to recommend specific public-private partnerships that would create new public and private investment capacity for adaptation actions in both sectors. That process should begin by assessing whether the Build America Investment Initiative,<sup>17</sup> including its centers developing new investment vehicles, can do more to support investments associated with adaptation. The task force should assess the vehicles being used for sustainable-technology investing (e.g., municipal and green bonds, green banks, pension funds), evaluate their applicability to adaptation investing, and determine if additional guidance is warranted to improve OMB scoring and assessments, particularly for projects that operate on the long time scale of adaptation measures. The task force should also consider mechanisms to amplify existing programs within the government designed to provide partial funding of new investments.<sup>d</sup>

***Recommendation 5: Expand public-private partnerships*** – The Federal Government should increase the use of public-private partnerships focused on climate-change adaptation. Partnerships pool knowledge and provide good leverage for limited resources.

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<sup>d</sup> Examples of programs include the Water Infrastructure Finance and Innovation Act ([www2.epa.gov/wifia](http://www2.epa.gov/wifia)) and the DOE Title XVII innovative clean energy loan guarantee program ([www.energy.gov/lpo/title-xvii](http://www.energy.gov/lpo/title-xvii)).

Below we highlight one existing partnership and suggest specific actions to expand its relevance to adaptation efforts. The program is aimed at activities within the electrical generation and distribution sector.

The Department of Energy (DOE) has established a Partnership for Energy-Sector Climate Resilience that includes 17 participating companies, representing 20 percent of U.S. electric generating capacity and serving about 25 percent of U.S. electricity customers. This partnership provides a mechanism for sustained engagement in climate adaptation between DOE and energy companies. An objective of the partnership is the accumulation and sharing of best practices for climate adaptation. PCAST recommends that the following additional specific activities be undertaken in the initial year of the partnership:

- (a) share best practices and lessons learned with the broader energy sector beyond the partnership, engaging the Edison Electric Institute, public utility commissioners, and rural utilities. This collection of best practices should be coordinated with FEMA, which has been conducting an ongoing program accumulating best practices across the sector; and
- (b) develop incentives for adaptation actions that take into account lessons learned from current approaches used by state regulatory authorities that allow utilities to recover in their rate structures the costs of investing in energy efficiency and renewable energy.

In addition to enhancing this existing partnership, we recommend three new areas for sustained public-private dialogue through partnerships and/or workshops.

- (a) OSTP should continue to encourage a public-private partnership focused on climate services that brings together the relevant Federal agencies with national, regional, and private-sector partners to assess information needs, share best practices, and identify opportunities for investment. The partnership should:
  - (1) aim to become the authoritative climate information service and first-stop entry point for data and guidance on adaptation actions;
  - (2) draw on the Federal regional climate centers<sup>18</sup> and include state and local managers as well as private-sector business leaders; and
  - (3) include active input from the Office of the Chief Technology Officer at OSTP, including the Chief Data Scientist, and the Office of the Federal Chief Information Officer at OMB.

Consistent with our focus in this report, this partnership should begin its efforts by looking specifically at the agriculture, energy, and water sectors.

- (b) The White House has engaged with insurance and re-insurance leaders to discuss opportunities to reduce the economic risks associated with extreme weather and climate change. We recommend that the interagency Council on Climate Preparedness and Resilience continue these dialogues with the additional inclusion of lenders, rating agencies, and the financial/banking sector. A sustained activity with these key stakeholders would help the Administration to explore opportunities for further collaboration in identifying, communicating, and reducing the impacts of extreme weather and climate change on economic sectors across the country. In addition, such an activity might work in coordination with the task force established from Recommendation 4.
- (c) The State, Local, and Tribal Leaders Task Force (SLTL-TF) on Climate Preparedness and Resilience identified several recommendations similar to those in this letter report, such as

developing data and tools; encouraging prudent investments and leveraging private capital and existing assets; and providing guidance at a scale and in a form adequate for guiding decision-making and investments. We recommend that the interagency Council on Climate Preparedness and Resilience convene local leaders engaged in innovative approaches to these challenges, including a group of SLTL-TF members, together with individuals from the private sector, to further develop and implement their recommendations by incorporating the private sector into community-based initiatives.

***Recommendation 6: Leverage existing programs to deploy a city-based pilot project:*** Leveraging the Administration’s Strong Cities, Strong Communities (SC2) initiative, a private-sector adaptation pilot project should be deployed in at least three of the SC2 cities (e.g., Detroit, MI; Fresno, CA; New Orleans, LA).<sup>e</sup> The project should engage the private sector directly in development and programming of adaptation activities in the target cities, with goals to:

- (a) understand private-sector information needs and how these overlap with the public-sector needs, as well as those of universities and non-governmental organizations, being addressed in SC2 cities;
- (b) test adaptation-focused efforts that align with the recommendations of this letter report, including mechanisms to unlock investment capital within the city for use in financing adaptation measures and, in line with the SC2 effort, to expand public-private partnerships focused on climate-change adaptation;
- (c) identify opportunities where public- and private-sector adaptation programs can be integrated and jointly undertaken to benefit both sectors; and
- (d) create an easily accessible database of results and communicate best practices and lessons learned from these pilot programs.

In summary, PCAST finds significant opportunities to further U.S. Government actions that can support private-sector moves to become better prepared for and more resilient to ongoing and prospective climate-change impacts. The recommendations outlined in this report leverage public-private partnerships to bring focus and commitment from all stakeholders to this important effort. PCAST stands ready to assist in the implementation and support of the ideas offered herein.

Sincerely,

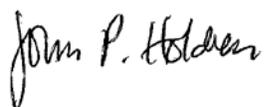
The Members of PCAST

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<sup>e</sup> PCAST recognizes the large number of place-based initiatives currently underway. PCAST has chosen to recommend the interagency pilot initiative SC2 for a private-sector adaptation pilot because SC2 has the ability to provide necessary technical assistance and access to Federal agency expertise and because of SC2’s goal of creating new public- and private-sector partnerships. Examples of place-based initiatives include: the Climate Action Champions ([www.whitehouse.gov/the-press-office/2014/12/03/fact-sheet-16-us-communities-recognized-climate-action-champions-leaders](http://www.whitehouse.gov/the-press-office/2014/12/03/fact-sheet-16-us-communities-recognized-climate-action-champions-leaders)); the Hampton Roads Sea Level Rise Preparedness and Resilience Intergovernmental Planning Pilot Project ([www.centerforsealevelrise.org/](http://www.centerforsealevelrise.org/)); the Mayor’s National Climate Action Agenda ([www.houstontx.gov/mayor/press/Climate\\_Action\\_Agenda.pdf](http://www.houstontx.gov/mayor/press/Climate_Action_Agenda.pdf)); the Resilience AmeriCorps ([www.whitehouse.gov/the-press-office/2015/08/19/resilience-ameri-corps-announces-ten-cities-its-pilot-program-support](http://www.whitehouse.gov/the-press-office/2015/08/19/resilience-ameri-corps-announces-ten-cities-its-pilot-program-support)); and the SLTL-TF’s “Preparedness Pilots” ([www.whitehouse.gov/the-press-office/2014/07/16/fact-sheet-taking-action-support-state-local-and-tribal-leaders-they-pre](http://www.whitehouse.gov/the-press-office/2014/07/16/fact-sheet-taking-action-support-state-local-and-tribal-leaders-they-pre)).

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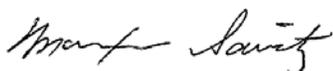


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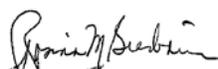


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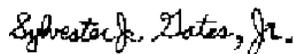
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- <sup>1</sup> President’s Council of Advisors on Science and Technology. Letter Report to the President on Climate Change. 2013. [www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast\\_energy\\_and\\_climate\\_3-22-13\\_final.pdf](http://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast_energy_and_climate_3-22-13_final.pdf) (accessed September 2015).
- <sup>2</sup> Executive Order 13693 of March 19, 2015, Planning for Federal Sustainability in the Next Decade, *Federal Register* 80, no. 57 (2015): 15871. [www.gpo.gov/fdsys/pkg/FR-2015-03-25/pdf/2015-07016.pdf](http://www.gpo.gov/fdsys/pkg/FR-2015-03-25/pdf/2015-07016.pdf).
- <sup>3</sup> U.S. President, Memorandum “Federal Leadership on Energy Management,” *Federal Register* 78, no. 237 (December 10, 2013): 75209, [www.gpo.gov/fdsys/pkg/FR-2013-12-10/pdf/2013-29669.pdf](http://www.gpo.gov/fdsys/pkg/FR-2013-12-10/pdf/2013-29669.pdf).
- <sup>4</sup> Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 40 C.F.R. § 60 (2015). [www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22842.pdf](http://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22842.pdf).
- <sup>5</sup> The American Business Act on Climate Pledge was launched on July 27, 2015. The most recent commitments are listed here: [www.whitehouse.gov/the-press-office/2015/07/27/fact-sheet-white-house-launches-american-business-act-climate-pledge](http://www.whitehouse.gov/the-press-office/2015/07/27/fact-sheet-white-house-launches-american-business-act-climate-pledge) (accessed November 2015).
- <sup>6</sup> Executive Order 13653 of November 1, 2013, Preparing the United States for the Impacts of Climate Change, *Federal Register* 78, no. 215 (2013): 66819. [www.gpo.gov/fdsys/pkg/FR-2013-11-06/pdf/2013-26785.pdf](http://www.gpo.gov/fdsys/pkg/FR-2013-11-06/pdf/2013-26785.pdf).
- <sup>7</sup> The National Drought Resilience Partnership [www.drought.gov/drought/content/ndrp](http://www.drought.gov/drought/content/ndrp) (accessed October 2015).
- <sup>8</sup> Executive Order 13690 of January 30, 2015, Establishing a Federal Flood Risk Standard and a Process for Further Soliciting and Considering Stakeholder Input, *Federal Register* 80, no. 23 (2015). [www.gpo.gov/fdsys/pkg/FR-2015-02-04/pdf/2015-02379.pdf](http://www.gpo.gov/fdsys/pkg/FR-2015-02-04/pdf/2015-02379.pdf).
- <sup>9</sup> U.S. Climate Data Initiative [www.data.gov/climate](http://www.data.gov/climate) (accessed November 2015).
- <sup>10</sup> U.S. Climate Resilience Toolkit [toolkit.climate.gov](http://toolkit.climate.gov) (accessed November 2015).
- <sup>11</sup> President’s State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience recommendations were delivered in November 2014. [www.whitehouse.gov/sites/default/files/docs/task\\_force\\_report\\_0.pdf](http://www.whitehouse.gov/sites/default/files/docs/task_force_report_0.pdf) (accessed October 2015).
- <sup>12</sup> Community Resilience Planning Guide for Buildings and Infrastructure Systems (Vol. I and II) was released on October 29, 2015. [www.nist.gov/el/resilience/guide.cfm](http://www.nist.gov/el/resilience/guide.cfm) (accessed November 2015).
- <sup>13</sup> USGCRP. 2012. *The National Global Change Research Plan 2012-2021: A Strategic Plan for the U.S. Global Change Research Program*. Washington, DC: United States Global Research Program.
- <sup>14</sup> National Academies of Sciences, Engineering, and Medicine. 2015. *Enhancing participation in the U.S. Global Change Research Program*. Washington, DC: National Academies Press.
- <sup>15</sup> [www.globalchange.gov/about/organization-leadership](http://www.globalchange.gov/about/organization-leadership) (accessed November 2015).
- <sup>16</sup> <https://www.whitehouse.gov/sites/default/files/omb/memoranda/2015/m-15-16.pdf> (accessed October 2015).
- <sup>17</sup> U.S. President, Memorandum “Expanding Federal Support for Predevelopment Activities for Nonfederal Domestic Infrastructure Assets,” *Federal Register* 80, no. 14 (January 16, 2015): 3455. [www.gpo.gov/fdsys/pkg/FR-2015-01-22/pdf/2015-01256.pdf](http://www.gpo.gov/fdsys/pkg/FR-2015-01-22/pdf/2015-01256.pdf).
- <sup>18</sup> [www.ncdc.noaa.gov/customer-support/partnerships/regional-climate-centers](http://www.ncdc.noaa.gov/customer-support/partnerships/regional-climate-centers) (accessed November 2015).