



THE WHITE HOUSE COUNCIL ON ENVIRONMENTAL QUALITY

*Progress Report of the Interagency  
Climate Change Adaptation Task  
Force: Recommended Actions in  
Support of a National Climate  
Change Adaptation Strategy*

*October 5, 2010*





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LIST OF ACRONYMS

CDC – Centers for Disease Control  
CEQ – Council on Environmental Quality  
DHS – Department of Homeland Security  
DOE – Department of Energy  
DOI – Department of the Interior  
DOT – Department of Transportation  
EPA – Environmental Protection Agency  
FEMA – Federal Emergency Management Agency  
FHWA – Federal Highway Administration  
HHS – Department of Health and Human Services  
HUD – Department of Housing and Urban Development  
IPCC – Intergovernmental Panel on Climate Change  
GAO – Government Accountability Office  
MCC – Millennium Challenge Corporation  
NASA – National Aeronautics and Space Administration  
NCA – National Climate Assessment  
NFIP – National Flood Insurance Program  
NFWPCAS – National Fish, Wildlife and Plants Climate Adaptation Strategy  
NGO – Non-Governmental Organization  
NOAA – National Oceanic and Atmospheric Administration  
OFEE – Office of the Federal Environmental Executive  
OMB – Office of Management and Budget  
OSTP – Office of Science and Technology Policy  
Task Force – Interagency Climate Change Adaptation Task Force  
UNDP – United Nations Development Programme  
UNEP – United Nations Environment Programme  
UNFCCC – United Nations Framework Convention on Climate Change  
USACE – U.S. Army Corps of Engineers  
USAID – U.S. Agency for International Development  
USDA – U.S. Department of Agriculture  
USFWS – U.S. Fish and Wildlife Service  
USGCRP – U.S. Global Change Research Program  
USGS – U.S. Geological Survey

*We envision a resilient, healthy, and prosperous Nation in the face of a changing climate.*

## EXECUTIVE SUMMARY

As concentrations of greenhouse gases and heat-trapping particles increase in the atmosphere, it is becoming ever more urgent to understand and prepare for the resulting changes in climate. These changes include not only temperature increases but also shifts in precipitation patterns, storm tracks, and other parameters. Climate change affects human health, water and energy supplies, food production, coastal communities, ecosystems, and many other aspects of society and the environment. The Obama Administration is committed to reducing greenhouse gas emissions to minimize the impacts of climate change. But mitigation alone is not enough. People are already feeling the impacts of climate change and future changes are inevitable. To prepare and respond to these impacts, the Administration is also committed to climate change adaptation.



**Coastal areas will need to prepare for rising sea levels and increased flooding.**

The scope, severity, and pace of future climate change impacts are difficult to predict. However, observations and long-term scientific trends indicate that the potential impacts of a changing climate on society and the environment will be significant. Projected impacts include more frequent heat waves and high-intensity precipitation events, rising sea levels, ocean acidification, and more prolonged

droughts. The year-round average air temperature in the United States has already risen by more than 2°F over the past 50 years and is projected to increase further in the future.<sup>1</sup> On average, wet areas of the United States will become wetter and dry areas will become drier. Adding to the challenge of responding to these impacts, climate-related changes do not act in isolation but rather interact with and often

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<sup>1</sup> *Global Climate Change Impacts in the United States*, Karl, Thomas R., Melillo, Jerry M., Peterson, Thomas C. (eds.). Cambridge University Press (2009).

exacerbate the impacts of other non-climatic stressors such as habitat destruction, overharvesting, and pollution.

Climate change is a global phenomenon that is influenced by and affects people and places throughout the world. Vulnerability to climate change differs across countries, communities, and even households. For instance, shoreline communities, socially or economically disadvantaged populations, as well as sensitive ecosystems such as coral reefs, wetlands, and Arctic habitats, are generally more vulnerable to climate impacts.

Understanding and preparing for climate change requires both domestic and international action. Adapting to climate change involves actions by individuals, businesses, governments, and others to build resilience and reduce vulnerability of human and natural systems to unavoidable climate impacts. Adaptation also reduces the long-term costs of responding to these impacts. Adaptation measures should focus on helping the most vulnerable people and places reduce their exposure and sensitivity to climate change and improve their capacity to predict, prepare for, and avoid adverse impacts. This requires thoughtful planning, continued investment in science and analytical tools, and the development of practical, cost-effective measures and technologies for adapting to future climate conditions.

Local impacts from climate change, such as crop loss or severe flooding, often have consequences that extend beyond regional or even national borders – for example, changes in human migration and disruptions in food supply. Climate change has direct implications for United States foreign assistance, national security, and diplomatic interests, including the considerable resources that the United States dedicates to disaster response and humanitarian assistance overseas. Moreover, the United States is a major contributor to, and beneficiary of, the global science and technology development community. The United States should continue to engage with international partners to enhance our understanding of climate change and leverage collective knowledge and resources.

### ***The Role of the Federal Government in Adapting to Climate Change***

The Federal Government has an important and unique role in climate adaptation, but it is only one part of a broader effort that must include multiple levels of government and private and non-governmental partners throughout the country. In particular, Federal leadership, guidance, information, and support are vital to planning for and implementing adaptive actions. Because climate impacts span political boundaries, the Federal Government must respond in partnership with communities, Tribes, and states –

many of which are already beginning to implement adaptation measures. Effective adaptation requires that stakeholders in affected regions coordinate their responses to climate impacts on shared infrastructure and resources.

At the core of the Federal Government's role should be a commitment to promote and implement best practices for adaptation, build greater public awareness and understanding of the importance of

adaptation, and maintain dialogue and partnerships with stakeholders and decision makers. The Government should continue to enhance services that enable informed decisions based on the best available science, and to work with the international community to improve knowledge sharing and



**The Federal Government has an important stake in adaptation because climate change directly affects Federal lands, including National Parks and forests.**

coordinate adaptation investments. The Government should also consider how Federal policies may lead to unintended consequences that increase the Nation's vulnerability to climate risks, thus making adaptation more costly and difficult. For example, certain policies may lead to increased development in the very areas that climate risks would suggest people avoid.

The Federal Government also has an important stake in adaptation because climate change directly affects a wide range of Federal services, operations, programs, assets (e.g., infrastructure, land), and our national security. The Government must exercise a leadership role to address climate impacts on Federal infrastructure interests and on natural, cultural, and historic resources that it has statutory responsibilities to protect. The Federal Government should identify its most significant adaptation risks and opportunities and incorporate response strategies into its planning to ensure that Federal resources are invested wisely and that its services and operations remain effective in the context of a changing climate. Importantly, the Federal Government must work in partnership with local, state, Tribal, and regional authorities as it develops and implements adaptation strategies, since most adaptive actions will occur at the local level.



***The Interagency Climate Change Adaptation Task Force***

The Interagency Climate Change Adaptation Task Force (Task Force) began meeting in Spring 2009. The Task Force is co-chaired by the Council on Environmental Quality (CEQ), the National Oceanic and Atmospheric Administration (NOAA), and the Office of Science and Technology Policy (OSTP). Recognizing the important role of the Federal Government in adaptation, President Obama signed an Executive Order on October 5, 2009 that called on the Task Force to recommend how the policies and practices of Federal agencies can be made compatible with and reinforce a national climate change adaptation strategy. The Executive Order charged the Task Force with delivering a report through the Chair of CEQ to the President within one year.

The Task Force, composed of more than 20 Federal agencies and Executive branch offices, formed workgroups to consider the capabilities of the Federal Government to respond to the impacts of climate change on select sectors, institutions, and agency responsibilities. The U.S. Global Change Research Program<sup>2</sup> (USGCRP) 2009 report, *Global Climate Change Impacts in the United States*, as well as other agency climate initiatives across the Federal Government, provided a basis for the work of the Task Force and its workgroups. In addition, the Task Force conducted numerous listening sessions and public outreach events with a wide range of stakeholders over the past year to gain greater perspective on how climate change is affecting our Nation and what steps the Federal Government can take to foster a more coordinated and effective national response. Discussions were held with state, Tribal, regional, and local government officials, domestic and international non-governmental organizations (NGOs), scientists, academia, industry groups, and others. These discussions provided critical input to the Task Force as it developed the recommendations in this report.

***Strategic Vision and Guiding Principles for Adaptation Policy and Actions***

The work of the Task Force has been guided by a strategic vision of a resilient, healthy, and prosperous Nation in the face of a changing climate. Achieving this vision will require innovative technology and ideas, as well as meaningful changes to policies, behavior, and institutions. It will also require a commitment to respond to climate change impacts that have already begun to occur while simultaneously taking proactive steps to understand and prepare for future climate conditions. To support these efforts, the Task Force has identified a set of guiding principles that should be considered by governments, communities, the private sector, and others in designing and implementing adaptation strategies.

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<sup>2</sup> The Global Change Research Act of 1990 established the U.S. Global Change Research Program to provide "...coordination of a comprehensive and integrated U.S. research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change." Thirteen Federal agencies contribute a total of \$2.1B (FY2010) toward the program.

**Guiding Principles for Adaptation**

**Adopt Integrated Approaches:** Adaptation should be incorporated into core policies, planning, practices, and programs whenever possible.

**Prioritize the Most Vulnerable:** Adaptation plans should prioritize helping people, places and infrastructure that are most vulnerable to climate impacts and be designed and implemented with meaningful involvement from all parts of society.

**Use Best-Available Science:** Adaptation should be grounded in the best-available scientific understanding of climate change risks, impacts, and vulnerabilities.

**Build Strong Partnerships:** Adaptation requires coordination across multiple sectors and scales and should build on the existing efforts and knowledge of a wide range of public and private stakeholders.

**Apply Risk-Management Methods and Tools:** Adaptation planning should incorporate risk-management methods and tools to help identify, assess, and prioritize options to reduce vulnerability to potential environmental, social, and economic implications of climate change.

**Apply Ecosystem-based Approaches:** Adaptation should, where relevant, take into account strategies to increase ecosystem resilience and protect critical ecosystem services on which humans depend to reduce vulnerability of human and natural systems to climate change.

**Maximize Mutual Benefits:** Adaptation should, where possible, use strategies that complement or directly support other related climate or environmental initiatives, such as efforts to improve disaster preparedness, promote sustainable resource management, and reduce greenhouse gas emissions including the development of cost-effective technologies.

**Continuously Evaluate Performance:** Adaptation plans should include measureable goals and performance metrics to continuously assess whether adaptive actions are achieving desired outcomes.

***Federal Policy Goals to Advance National Adaptation***

The Task Force recommends that the Federal Government focus on a set of overarching goals that are consistent with the strategic vision and guiding principles. These policy goals are intended to reinforce existing adaptation efforts, harness a range of capabilities and resources across the Federal Government, and build strong partnerships with local, state, regional, Tribal, and international stakeholders to advance a common adaptation agenda.

**Summary of Policy Goals and Recommended Actions for the Federal Government**

1. **Encourage and Mainstream Adaptation Planning across the Federal Government** – *Climate change will challenge the mission, operations, and programs of nearly every Federal agency. Ensuring that the Federal Government has the capacity to execute its missions and maintain important services in the face of climate change is essential.*
  - Implement adaptation planning within Federal agencies
  - Employ a flexible framework for agency adaptation planning
  - Use a phased and coordinated approach to implement agency adaptation
  
2. **Improve Integration of Science into Decision Making** – *Access to integrated, interdisciplinary science is critical to understanding potential climate change impacts, and informing the development, implementation and evaluation of response strategies.*
  - Create a “roadmap” of existing Federal science efforts that inform and support adaptation
  - Prioritize activities that address science gaps important to adaptation decisions and policies
  - Build science translation capacity to improve the communication and application of science to meet the needs of decision makers
  - Explore approaches to develop an online data and information clearinghouse for adaptation
  
3. **Address Key Cross-Cutting Issues** – *The breadth of certain climate change impacts creates challenges that cut across the jurisdictions and missions of individual Federal agencies. Addressing these issues will require a collaborative approach along with coordination and partnerships at the local, state, Tribal, and regional levels. The Task Force focused on an initial set of cross-cutting issues and recommends the following actions:*
  - Improve water resource management in a changing climate**
    - Strengthen data and information systems for understanding climate change impacts on water
    - Improve water-use efficiency to reduce climate change impacts
    - Develop a national action plan to strengthen climate change adaptation for freshwater resources
  
  - Protect human health by addressing climate change in public health activities**
    - Enhance the ability of Federal decision makers to incorporate health considerations into adaptation planning
    - Build integrated public health surveillance and early warning systems to improve detection of climate change health risks
    - Promote resilience of individuals and communities to climate-related health risks
  
  - Build resilience to climate change in communities**
    - Ensure relevant Federal regulations, policies, and guidance demonstrate leadership on community adaptation
    - Integrate adaptation considerations into Federal programs that affect communities

Facilitate the incorporation of climate change risks into **insurance** mechanisms

- Explore a public/private partnership to produce an open-source risk assessment model

Address additional cross-cutting issues

- Develop a strategic action plan focused on strengthening the resilience of coastal, ocean, and Great Lakes communities and ecosystems to climate change
- Develop a strategy for reducing the impacts of climate change on the Nation's fish, wildlife, and plant resources and their habitats<sup>1</sup>

**4. Enhance Efforts to Lead and Support International Adaptation** – *Climate change poses risks and opportunities that are important to many of the U.S. Government's international development, security, and diplomatic priorities. Climate change adaptation should be a core consideration in the design and implementation of U.S. foreign assistance activities. Agencies should enhance collaboration to support international adaptation objectives.*

- Develop a Government-wide strategy to support multilateral and bilateral adaptation activities and integrate adaptation into relevant U.S. foreign assistance programs
- Enhance collaboration on adaptation among international development, national security, and technical support agencies
- Engage global development partners and the private sector to promote knowledge sharing and coordinate investments

**5. Coordinate Capabilities of the Federal Government to Support Adaptation** – *The Federal Government should improve coordination of its science, services, and assessments to better support stakeholders.*

- Build and maintain strong partnerships to increase responsiveness of Federal Government activities to support local, state, and Tribal needs
- Develop regional climate change adaptation consortia among Federal agencies
- Establish performance metrics for evaluating Federal adaptation efforts

<sup>1</sup> Pursuant to Congressional direction, development of a national plan to address fish, wildlife, and plant resources is already underway.

***Next Steps: Building a More Resilient Nation***

The Task Force considers the recommendations in this report an initial set of priorities that the Federal Government should pursue to advance a national approach to adaptation. Implementing these actions will require the individual and collaborative efforts of Federal agencies. Agencies will initiate a formal adaptation planning process with the support of the Office of the Federal Environmental Executive (OFEE). USGCRP will continue efforts to build a robust body of science and critical tools to support decision making, and interagency workgroups will collaborate to address cross-cutting issues and support international adaptation objectives. In addition, agencies will continue to develop and strengthen individual and interagency adaptation initiatives, such as the National Climate Assessment and efforts to provide climate services (e.g., modeling, decision-support tools). The Task Force will continue to

convene over the next year to support and oversee the implementation of these efforts and to establish a meaningful and sustained dialogue with partners at all levels of government. The Task Force will prepare another progress report in October 2011 that summarizes the results of implementation efforts and refines or expands recommended policy goals and actions where necessary.

The Task Force's work over the past year has increased awareness of climate change across the Federal Government and generated actions to address it. As the Government further integrates adaptation into its operations, policies and programs and provides guidance, and assistance, it will catalyze additional adaptation planning across the Nation. The Federal Government will continue to develop a coordinated approach to adaptation by building partnerships with local, state, Tribal, private, and nonprofit stakeholders, many of whom already are playing a strong leadership role and implementing actions critical to a national adaptation strategy. Together, through the Federal actions described in this report and the collective action of stakeholders and government at all levels, we will strive to be a nation that better understands, and is better prepared for, the impacts of a changing climate.

## PART ONE. INTRODUCTION

The global climate is changing, and the impacts of this change are being felt across the United States and the world. Climate change affects nearly every aspect of society, from our ecosystems and infrastructure, to our public health and our economic and national security. Preparing our Nation for the impacts of climate change requires the collective efforts and collaboration of people and institutions across the country, and the collective resources and ideas of partners throughout the world. Many steps are already being taken to improve our understanding of climate change, increase our capacity to anticipate and prepare for adverse impacts, and reduce man-made factors (namely greenhouse gas emissions) that contribute to climate change. However, further efforts and coordination are required – at all levels of government, and among the private sector, academia, and non-governmental organizations – to ensure that our response to climate change is effective.

Recognizing the urgency of adaptation and the important role of the Federal Government in reducing the Nation’s vulnerability to climate change, President Obama signed an Executive Order in October 2009 that required the Interagency Climate Change Adaptation Task Force (Task Force) to assess what the Federal Government is doing to adapt to climate change and to provide recommendations for additional actions to support a national adaptation strategy. This report presents the Task Force’s initial findings and recommendations. In this report, the Task Force has outlined a set of guiding principles, strategic priorities, and near-term actions that are intended to: (1) further focus and strengthen the Federal Government’s efforts on adaptation; and (2) promote greater coordination and collaboration among stakeholders within and outside the Government to advance a national adaptation strategy.

This report is not intended to represent a comprehensive national adaptation strategy, in and of itself. The goals and recommended actions it outlines focus on the Federal Government’s role in a national approach, and are intended to foster collective action toward a common adaptation agenda. These are initial steps in what must be a long-term, iterative approach to building a resilient, healthy, and prosperous Nation in the face of a changing climate.

*“... [T]he people of Hāna, Maui are very concerned about the effects of climate change. Not only has our everyday living been affected, but our culture as well. We depend on our freshwater streams and taro patches (lo’i) for sustenance, which allows us to practice our Hawaiian culture. With the increase in drought, our streams and taro patches have dried up, killing the native aquatic species we gather (‘o’opu). ... Also, with sea level rise, saltwater intrusion will affect our low-land taro patches and will make the survival of the sources of sustenance, our people, and our practices that much more difficult.”*

– comments from Hāna, Maui at the Hawaii public outreach meeting

## PART TWO. THE IMPORTANCE OF ADAPTATION

Climate change is affecting many aspects of our society, our livelihoods, and our environment. Communities across the Nation are experiencing climate change impacts, such as changes in average temperatures, more extreme weather events, and rising sea levels.<sup>3</sup> Historically, societies and ecosystems have adjusted or adapted to natural variability in climatic conditions. However, the pace and impacts of climate change are occurring outside the range of past experiences, rendering many of our current adaptive mechanisms insufficient. In addition, climate change impacts do not act in isolation; rather, climate-related changes interact with and often magnify the impacts of existing non-climatic stressors. Decision-makers across the Nation will need to take proactive measures to better understand and prepare for current and future changes in climate conditions.

### Definitions for Key Terms in This Document<sup>1</sup>

- **Adaptation:** Adjustment in natural or human systems to a new or changing environment that exploits beneficial opportunities or moderates negative effects.
- **Resilience:** A capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to social well-being, the economy, and the environment.
- **Vulnerability:** The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes.
- **Mitigation:** An intervention to reduce the causes of changes in climate, such as through reducing emissions of greenhouse gases to the atmosphere.

<sup>1</sup> *Adapting to the Impacts of Climate Change, America's Climate Choices: Panel on Adapting to the Impacts of Climate Change*, National Research Council, (2010).

There is scientific consensus that the Earth's climate is changing due to increased concentrations of greenhouse gases (including carbon dioxide) in the atmosphere.<sup>4,5,6</sup> As a result, increased energy trapped in the atmosphere and the oceans due to these higher concentrations is already leading to impacts, including warmer average water and air temperatures (Figure 1), in the United States and globally.

The Obama Administration is committed to reducing greenhouse gas emissions to minimize the future impacts of climate change. However, the climate impacts we are observing today will continue to increase, at least in the short-term, regardless of the degree to which greenhouse gas emissions are managed. This is driven by factors such as the long-lived nature of certain greenhouse gases in the atmosphere and the absorption of heat by the Earth's oceans. Even if we reduce our emissions, global average temperatures are predicted to rise over the next 100 years (Figure 2).<sup>7</sup> In the long-term, the

<sup>3</sup> *Global Climate Change Impacts in the United States*, Karl, Thomas R., Melillo, Jerry M., Peterson, Thomas C., (2009).

<sup>4</sup> *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Parry, M.L., Canziani, O. F., Palutikof, J. P., van der Linden, P. J., et. al., contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change 2007 (2007).

<sup>5</sup> *Global Climate Change Impacts in the United States*, Karl, Thomas R., Melillo, Jerry M., Peterson, Thomas C., (2009).

<sup>6</sup> *Advancing the Science of Climate Change, America's Climate Choices: Panel on Advancing the Science of Climate Change*, National Research Council, (2010).

<sup>7</sup> *Global Climate Change Impacts in the United States*, Karl, Thomas R., Melillo, Jerry M., Peterson, Thomas C., (2009).



ability to manage greenhouse gas emissions and moderate or reduce atmospheric concentrations of greenhouse gases will affect the magnitude of the impacts to which we will need to adapt.<sup>8</sup> Therefore, mitigation and adaptation are inextricably linked, and both are required in order to reduce the impacts of climate change.

The scope, severity, and pace of future climate change are difficult to predict with precision; however, observations and long-term trends indicate that the potential impacts of a changing climate on society and the environment will be significant. The 2009 U.S. Global Change Research Program (USGCRP) report, *Global Climate Change Impacts in the United States*, documents climate change impacts to our Nation that already have been observed. These impacts include increased average temperatures, more frequent heat waves and high-intensity precipitation events, higher sea levels, and more prolonged droughts, among others.<sup>9</sup> The year-round average air temperature of the U.S. has already risen by more than 2°F over the past 50 years and is projected to increase more in the future.<sup>10</sup> In addition, the intensity of severe precipitation events has increased across the U.S. over the last 50 years (Figure 3), and continued increases in both frequency

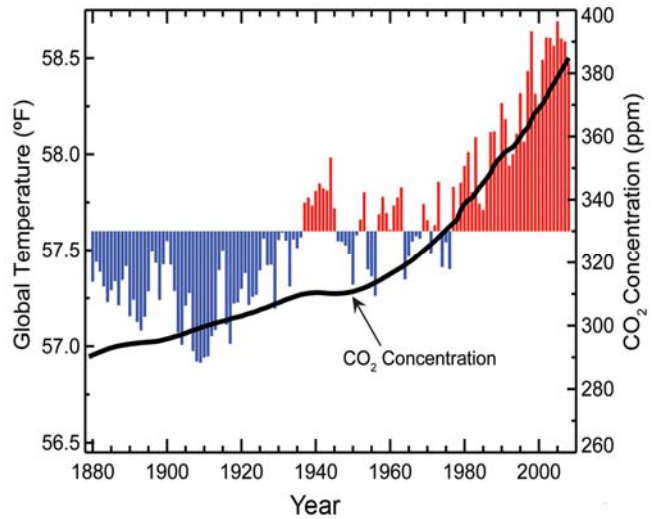


Figure 1. Global annual average temperature (as measured over both land and oceans) and carbon dioxide concentration from 1880 to present day. Red bars indicate temperatures above and blue bars indicate temperatures below the average temperature for the period 1901-2000. Year-to-year fluctuations in temperature are due to natural processes, such as the effects of El Niños, La Niñas, and the eruption of large volcanoes.<sup>1</sup>

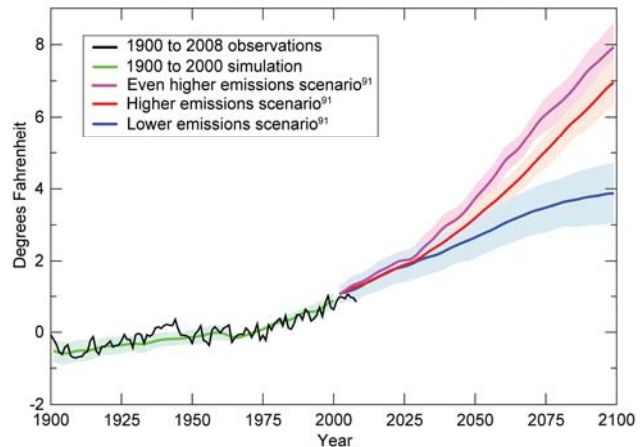


Figure 2. Observed and projected changes in the global average temperature under three IPCC emissions scenarios. The lines show the central projections from a set of climate models, and the shaded areas indicate the likely ranges of these projections. A wider range of model types shows outcomes from 2 to 11.5°F. Changes are relative to the 1960-1979 average.<sup>2</sup>

<sup>1</sup> *Global Climate Change Impacts in the United States*, Karl, Thomas R., Melillo, Jerry M., Peterson, Thomas C., (2009).

<sup>2</sup> *Ibid.*

<sup>8</sup> *Ibid.*

<sup>9</sup> *Ibid.*

<sup>10</sup> *Ibid.*



and intensity of the heaviest downpours are projected in the future. At the same time, the number of dry days is projected to increase, especially in the more arid areas, with the Midwest and the Southwest particularly threatened by drought.<sup>11</sup>

Climate impacts, both within the United States and across the globe, will not be distributed evenly. For instance, temperature increases in the last ten years have generally been greatest in the northern latitudes (Figure 4). Temperatures in Alaska have increased by approximately twice as much as in the rest of the Nation, with significant impacts on sea ice, ecosystems, and coastal communities.<sup>12</sup>

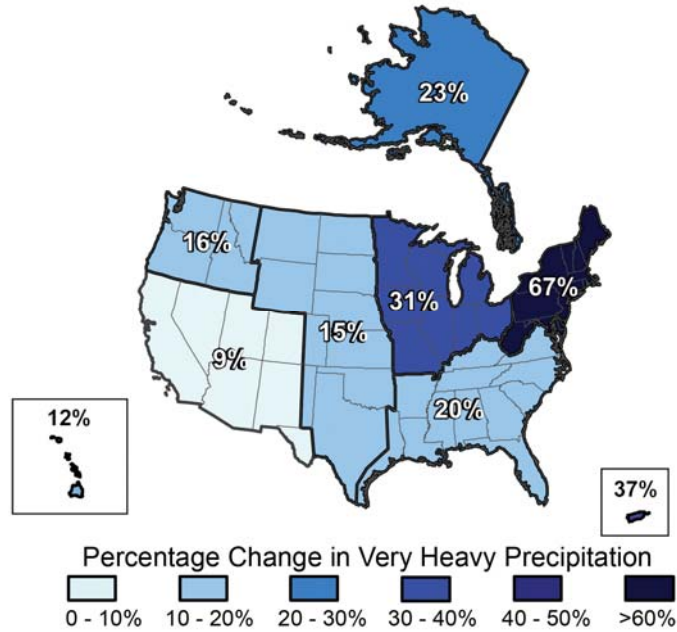


Figure 3. Percent increases in the amount falling in very heavy precipitation events (defined as the heaviest 1% of all daily events) from 1958 to 2007 for each region.<sup>1</sup>

<sup>1</sup> *Global Climate Change Impacts in the United States*, Karl, Thomas R., Melillo, Jerry M., Peterson, Thomas C., (2009).

The uneven nature of climate change impacts creates differing levels of vulnerability across countries, communities, and even households, with important implications for adaptive actions. In addition, non-climatic stressors can interact with and exacerbate the impacts of climate stressors. Social and economic

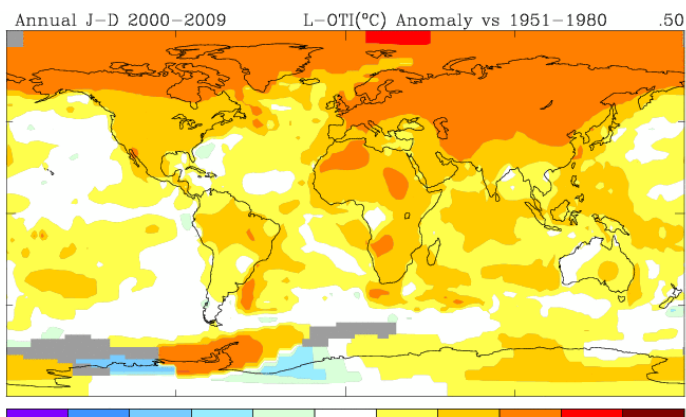
*"A hurricane is a threat that you can see in the local news. You can see it coming, marching across the ocean. You can see where it's headed and what to expect when it hits. You can plan for the recovery and for an eventual return to normal. With climate change there's no return to normal."*

– Honorable Katy Sorenson, Miami-Dade County Commissioner and Chair, Budget, Planning and Sustainability at the Miami public outreach meeting

factors (e.g., economic status, race, ethnicity, age, gender, and health) can significantly affect people's exposure and sensitivity to climate change, as well as their ability to recover. As with human populations, certain ecosystems (e.g., coral reefs, wetlands, Arctic habitats) are particularly vulnerable to the impacts of climate change. In addition, ecosystems that are degraded or depleted due to non-climatic stressors (e.g., habitat destruction, overharvesting, pollution) have lower resilience to climate change. The effects of climate change on species, habitats, and ecosystems are

<sup>11</sup> *Ibid.*

<sup>12</sup> *Ibid.*



**Figure 4. Average surface temperature trends (degrees per decade) for the decade 2000-2009 relative to the 1950-1979 average. Warming was more pronounced at high latitudes, especially in the Northern Hemisphere and over land.<sup>1</sup>**

<sup>1</sup>*Advancing the Science of Climate Change, America's Climate Choices: Panel on Advancing the Science of Climate Change, National Research Council, (2010).*

conditions; a company relocating key facilities away from coastal areas vulnerable to sea level rise and hurricanes; a community updating its ordinances to protect wetland habitat that provides critical ecosystem services; a city developing early warning systems for severe storms; and a county increasing its water-use efficiency to prepare for more frequent droughts.

### PART THREE. THE ROLE OF THE FEDERAL GOVERNMENT IN ADAPTING TO CLIMATE CHANGE

Multiple stakeholders, including governmental, non-governmental, and private organizations, must work together across different scales and sectors to successfully adapt to climate change. The Federal Government has an important and unique role in this collective process. In particular, Federal leadership, guidance, and support are important to help design and implement actions based on the best available information, science, and technology. Just as importantly, the Federal Government must work in partnership with communities, Tribes, and states – many of which are already beginning to implement adaptation measures – because climate impacts span political boundaries. To effectively adapt to climate change, stakeholders in affected regions should coordinate their responses to climate impacts on shared infrastructure and resources.

pervasive and significant across the globe. Impacts of climate change on ecosystem services – the benefits ecosystems provide that humans depend on, such as clean water, coastal protection, flood protection, food production, and recreation – are a major concern.

Adaptation includes a wide range of activities to build resilience and reduce vulnerability to climate change, such as: a farmer growing a different crop variety better suited to warmer or drier

The Federal Government should promote best practices for adaptation to build greater public awareness and understanding of the importance of adaptation, and maintain critical dialogue and partnerships with stakeholders and decision makers. The Federal Government must enhance its ability to provide public and private actors with accessible and localized climate risk, impact, and vulnerability information to support their decision making. Furthermore, the Federal Government should continue to work with the international community to increase our scientific understanding of climate change and improve global coordination in responding to climate impacts.

The Federal Government also has an important stake in adaptation because climate change directly affects Federal services, operations, and programs across the country. Virtually every aspect of the Federal Government will be impacted by climate change in some way. The Government must exercise leadership in addressing climate impacts on Federal infrastructure interests and on the natural, cultural, and historic resources that it has statutory responsibilities to protect. Climate change will also affect our national security. Adaptation requires careful planning to incorporate appropriate strategies in agency missions and operations to ensure that Federal resources are invested wisely and that agency services and operations remain effective. The Federal Government must coordinate its adaptation strategies with local, state, and Tribal partners, as the majority of effective adaptation strategies are implemented at the local to regional scale.

Agencies should work individually, collaboratively, and with the Task Force to ensure that resources are allocated to maximize their impact and avoid unnecessary duplication. In the current fiscal climate, agencies should implement the recommendations in this report with the understanding that activities will be funded within current overall budget amounts and guidance.

#### **PART FOUR. THE INTERAGENCY CLIMATE CHANGE ADAPTATION TASK FORCE**

The Interagency Climate Change Adaptation Task Force (Task Force) began meeting in Spring 2009. The Task Force is co-chaired by the Council on Environmental Quality (CEQ), the National Oceanic and Atmospheric Administration (NOAA), and the Office of Science and Technology Policy (OSTP). The Executive Order signed by the President in October 2009 required the Task Force to deliver a report through the Chair of CEQ to the President within one year to outline progress on agency actions in support of a national strategy and recommendations for additional actions.

The Task Force, composed of over 20 Federal agencies and Executive branch offices, formed workgroups to consider the Federal Government’s capabilities to respond to climate change impacts on various critical sectors, institutions, and agency mission responsibilities. Over 300 Federal employees participated in the Task Force and its workgroups over the past year (Appendices A and B).

The Task Force considered many adaptation initiatives, challenges, and opportunities as it developed this report. Ongoing and emerging Federal agency climate change initiatives, including the USGCRP 2009 report, *Global Climate Change Impacts in the United States*, provided a basis for the work of the Task Force. In addition, the Task Force and its workgroups conducted over 35 public outreach meetings, listening sessions, and other public engagement events over the last year to gain greater perspective on how climate change is affecting our Nation and what steps the Federal Government can take to foster a more coordinated and effective national response.

*“We work closely with communities to help governments, businesses and residents to understand their disaster risk and what they can do to prevent, prepare for, and be more resilient to natural disasters....Our concern with the increase and frequency of extreme weather events, and our increase in emergency response, is the most “at risk” individuals. How can we do more to prepare our individuals, especially the most vulnerable, for the unexpected?”*

– Lisa Hunter, American Red Cross at the Chicago public outreach meeting

Stakeholders at these events conveyed input and ideas that were integral to the Task Force’s work and helped shape the vision, guiding principles, and recommendations articulated in this report. Maintaining a sustained and meaningful dialogue with stakeholders will continue to be an essential element of the Federal Government’s approach to adaptation.

## **PART FIVE. STRATEGIC VISION AND GUIDING PRINCIPLES FOR ADAPTATION POLICY AND ACTIONS**

The work of the Task Force has been guided by a strategic vision of a resilient, healthy, and prosperous Nation in the face of a changing climate. The United States must adapt to climate change in order to safeguard people, places, and natural resources both domestically and abroad. Our Nation is committed to reducing greenhouse gas emissions to limit the magnitude of future climate change, but impacts will continue to occur. We must respond to those impacts that are already happening and prepare for future ones. Climate change adaptation requires not only innovative technology and ideas, but also meaningful changes to policies, behavior, and institutions. Adaptation provides an opportunity to revisit the way that business is conducted and to improve existing policies and practices, including those that increase vulnerability, in order to ensure a more sustainable future.

### *Guiding Principles*

To support these efforts, the Task Force has identified a set of guiding principles that should be considered in the design and implementation of adaptation strategies.

- **Adopt integrated approaches.** Climate change preparation and response should be integrated into core policies, planning, practices, and programs whenever possible.
- **Prioritize the most vulnerable.** Adaptation plans should prioritize helping people, places, and infrastructure that are most vulnerable to climate impacts. They should also be designed and implemented with meaningful involvement from all parts of society. Issues of inequality and environmental justice associated with climate change impacts and adaptation should be addressed.

- **Use best-available science.** Adaptation should be grounded in best-available scientific understanding of climate change risks, impacts, and vulnerabilities. Adaptive actions should not be delayed to wait for a complete understanding of climate change impacts, as there will always be some uncertainty. Plans and actions should be adjusted as our understanding of climate impacts increases.



Observation systems help us understand changes in the climate so that decisions can be based on the best-available science.

- **Build strong partnerships.** Adaptation requires coordination across multiple sectors, geographical scales, and levels of government and should build on the existing efforts and knowledge of a wide range of stakeholders. Because impacts, vulnerability, and needs vary by region and locale, adaptation will be most effective when driven by local or regional risks and needs.
- **Apply risk-management methods and tools.** A risk management approach can be an effective way to assess and respond to climate change because the timing, likelihood, and nature of specific climate risks are difficult to predict. Risk management approaches are already used in many critical decisions today (e.g., for fire, flood, disease outbreaks), and can aid in understanding the potential consequences of inaction as well as options for risk reduction.

- **Apply ecosystem-based approaches.** Ecosystems provide valuable services that help to build resilience and reduce the vulnerability of people and their livelihoods to climate change impacts. Integrating the protection of biodiversity and ecosystem services into adaptation strategies will increase resilience of human and natural systems to climate and non-climate risks, providing benefits to society and the environment.
- **Maximize mutual benefits.** Adaptation should, where possible, use strategies that complement or directly support other related climate or environmental initiatives, such as efforts to improve disaster preparedness, promote sustainable resource management, and reduce greenhouse gas emissions including the development of cost-effective technologies.
- **Continuously evaluate performance.** Adaptation plans should include measurable goals and performance metrics to continuously assess whether adaptive actions are achieving desired outcomes. In some cases, the measurements will be qualitative until more information is gathered to evaluate outcomes quantitatively. Flexibility is a critical to building a robust and resilient process that can accommodate uncertainty and change.

These principles and concepts are not new. They are being applied in cities around the world that are working to protect health and infrastructure; in states working collaboratively at regional levels to improve management and sustainability of land, water, and energy resources; through the concerns of citizens who live in vulnerable locations; and through the experiences of Federal agencies that are considering how climate change challenges their existing missions, operations, and programs.

## **PART SIX. CURRENT FEDERAL GOVERNMENT EFFORTS IN SUPPORT OF ADAPTATION**

Substantial activities are already underway across the Federal Government to build adaptive capacity and increase resilience to climate change. These activities include efforts to improve understanding of climate science and impacts, to incorporate climate change considerations into policies and practices, and to strengthen technical support and capacity for adaptation decision making. Some efforts are large collaborative undertakings involving Federal and non-Federal partners while others are smaller and at the program-level. Examples of Federal agencies' current and proposed efforts to support adaptation include:



*Interagency Activities*

- **USGCRP** has invested significant resources in understanding and modeling the physical science of climate and has also funded research on the implications of climate change for natural systems and human health and welfare. These include observing systems in the oceans, on land, and in the atmosphere; research on climate impacts and vulnerability; and science in support of decision making. USGCRP is currently in the process of establishing a new Adaptation Strategic Program Element to provide accessible information to support adaptation decisions at all scales.
- The **National Climate Assessment (NCA)**, which is required every four years under the Global Change Research Act of 1990 and conducted under the USGCRP, will identify science needs for understanding current and future climate impacts and regional or sector-related vulnerability to those impacts, supporting adaptation and mitigation decisions, and informing effective translation of science into services and applications.

*“Climate change is one of the greatest public health challenges of this century...We have to help raise public awareness and understanding of climate change impacts on health, the need to prepare for these changes, and the need to take strong and urgent actions to reduce emissions in order to avoid the most catastrophic impacts of climate change. And that will only happen if we work closely with local agencies and community based organizations to educate, empower and engage communities in actions to mitigate and adapt to climate change.”*

– Dr. Linda Rudolph, Deputy Director of the centers for chronic disease and health promotion, State of California at the Portland public outreach meeting

*Agency Activities*

- **National Oceanic and Atmospheric Administration’s (NOAA)** proposed Climate Service will seek to combine the agency’s climate science and technical capabilities with new and existing service development, delivery, and communication capabilities to create an organization that advances scientific understanding, engages users collaboratively, and delivers services.
- The **Department of the Interior (DOI)** is developing a network of eight regional Climate Science Centers and 22 Landscape Conservation Cooperatives to inform science-based adaptation and mitigation strategies and adaptive management techniques in partnership with resource managers. In cooperation with other Federal and state agencies, this network will help to connect natural and cultural resource managers to relevant science support, and work with local partners to provide tailored information for regional adaptation decisions.
- The **Department of Agriculture (USDA)** has integrated climate change objectives into its strategic plans and is expanding its focus on climate-related research and delivery capacity across its agencies to provide climate services to rural and agricultural stakeholders through existing

programs, including the Cooperative Extension Service, the Natural Resources Conservation Districts, and the USDA Forest Service's Climate Change Resource Center.

- The **Department of Transportation (DOT)** is analyzing the vulnerabilities of critical transportation infrastructure in the Gulf of Mexico region, and developing risk management tools that can be applied in the Gulf and elsewhere.
- The **Department of Energy (DOE)** is developing energy technologies that will significantly contribute to climate change adaptation, including programs focused on reducing the energy and water intensity of electricity generation and use, and transportation fuels production. DOE is also developing information and tools that will help local and regional planners anticipate climate change effects and adaptation needs.
- The **Environmental Protection Agency (EPA)** is supporting local decision makers through a variety of programs and online tools, including the Climate Ready Estuaries program and the Climate Ready Water Utilities Working Group. EPA has also taken the lead on a number of regional climate adaptation projects.
- The **Department of Housing and Urban Development's (HUD)** Office of Policy Development and Research is helping to develop a toolkit of HUD initiatives that will provide new resources to communities to address the challenges resulting from climate change and growth patterns at the local level.
- The **National Aeronautics and Space Administration (NASA)** has created an integrated effort between its Earth Science Division and Environmental Management Division to look at the long-term effects of climate change for its Centers, many of which are in climate-sensitive areas, and to enable more informed future planning for its Centers and resource management.
- The **Department of the Navy** established Task Force Climate Change which has developed and begun to implement two roadmaps for climate change adaptation in the Arctic and across the globe. Activities include conducting joint and combined exercises in the Arctic, initiating education on climate change science and security, and incorporating adaptation in Navy strategic objectives and plans.
- The **Department of State** is contributing to adaptation through the U.N. Framework Convention on Climate Change (UNFCCC) and related funding mechanisms, and is leading international efforts to foster more effective coordination among institutions engaged in adaptation.
- The **U.S. Agency for International Development (USAID)** has prepared a guidance document on integrating adaptation into foreign assistance programs, sponsored the development of the Famine Early Warning Systems Network, and developed or contributed to several other analytical tools, databases, and guidance materials on international adaptation.



- The **Department of the Treasury** oversees U.S. contributions to several multilateral investment funds that help developing countries improve their adaptive capacity, such as the UNFCCC Special Climate Change Fund and the World Bank's Pilot Program for Climate Resilience.
- The **Office of Science and Technology Policy (OSTP)** is helping Federal agencies to develop a coherent national architecture for these and other Federal climate assessments and services.

## **PART SEVEN. FEDERAL POLICY GOALS TO ADVANCE NATIONAL ADAPTATION**

The Task Force recommends that the Federal Government focus on a set of five overarching policy goals that are consistent with the strategic vision and guiding principles described above and build upon current efforts. These policy goals are intended to reinforce existing adaptation efforts, harness a range of capabilities and resources across the Federal Government, and build strong partnerships with local, state, regional, Tribal, and international stakeholders to achieve a common mission of developing and maintaining a resilient, healthy, and prosperous society in the face of a changing climate.

- 1. Encourage and mainstream adaptation planning across the Federal Government*
- 2. Improve integration of science into decision making*
- 3. Address key cross-cutting issues*
- 4. Enhance efforts to lead and support international adaptation*
- 5. Coordinate capabilities of the Federal Government to support adaptation*

Each goal includes a set of supporting recommendations for near-term action. The Task Force should work over the next year to monitor and support implementation of the recommendations presented below.

### **GOAL 1: ENCOURAGE AND MAINSTREAM ADAPTATION PLANNING ACROSS THE FEDERAL GOVERNMENT**

Climate change will challenge the mission, operations, and programs of nearly every Federal agency. Ensuring the capacity of Federal Government agencies to execute their missions, domestically and internationally, and maintain essential services in the face of climate change will be a critical factor in successful adaptation as a nation. Agencies should consider how climate change affects them using a flexible, forward-thinking approach that moves away from using past conditions as indicators of the future. This approach should include a commitment to ongoing evaluation and revision of management

activities and decisions through adaptive management. Implementing this recommendation requires agencies to identify and address climate vulnerabilities and opportunities and build resilience to climate change. There is no single planning approach appropriate for all agencies; however, using a consistent, but flexible, framework will facilitate coordination across agencies and allow them to leverage common tools and methods.

**Recommended Action: Implement adaptation planning within Federal agencies**

Individual Federal agencies should establish and implement coordinated climate adaptation action plans that address the unique and interdisciplinary challenges posed by climate change to their missions, operations, and programs. In their adaptation action plans, agencies should identify measures to incorporate climate change-related considerations into existing agency planning processes, including the development of measurable goals and performance metrics to guide adaptation efforts and assess whether efforts are achieving desired outcomes.

*“We can all relate to the very tangible impacts of a changing climate (for example – streets flooded during extreme rain storms, extended seasons for garden vegetables). Because we are talking about real, contemporary experiences when we talk about adaptation – we have a chance to talk about facts and about real, achievable actions. And a chance to learn about science and problem-solving.”*

– Anonymous at the Chicago public outreach meeting

This will help to streamline and enhance adaptation efforts currently underway within agencies as well as improve information sharing among agencies, accelerating implementation and learning. Agency adaptation planning will also foster greater attention to and action on critical issues at local, state, Tribal, and regional levels.

The Executive Office of the President should support the implementation of agency adaptation planning. Implementation should follow a similar planning process to that used for sustainability planning under Executive Order 13514 on Federal Leadership in Environmental, Energy, and Economic Performance, in which the CEQ Office of the Federal Environmental Executive (OFEE) works in concert with the Office of Management and Budget (OMB). The CEQ Chair will issue implementing instructions to agencies within 120 days of this report. The Agency Adaptation Workgroup formed under the Task Force should be engaged and support OFEE in this process.

As agency planning moves forward, there is also an opportunity to develop common tools to improve the effectiveness and efficiency of implementing climate change adaptation across the Federal Government.

Agencies should work with OFEE and OMB to identify and coordinate the development of common and shared effective tools for science translation, economic and decision analysis, and evaluation of agency adaptation efforts.

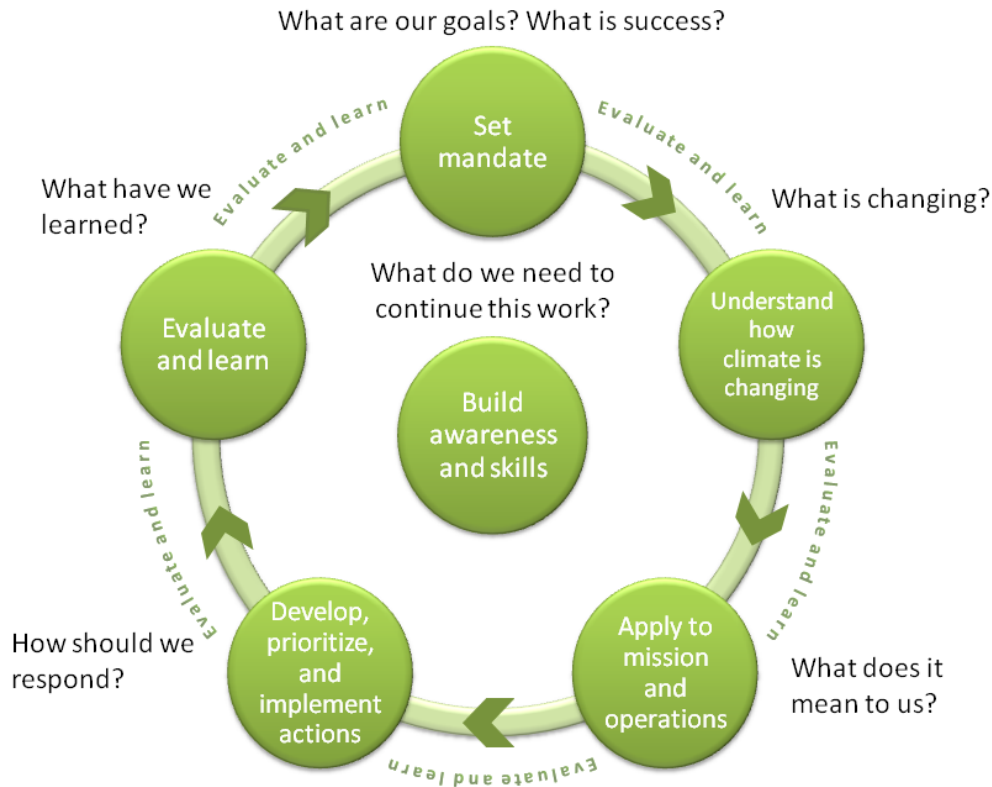
**Recommended Action: Employ a flexible framework for agency adaptation planning**

Federal agency adaptation planning should be based on a six-step flexible planning framework to enable a process that is both consistent and tailored to the specific planning needs of each agency. The flexible framework (Figure 5) highlights the need to build agency skills and capacity; develop an adaptation mandate with success measures; assess and understand the substantial risks, vulnerabilities, and opportunities posed by climate change; develop, prioritize, and implement adaptation actions; and evaluate the results and lessons learned from the process to improve future adaptation.

The flexible framework is not meant to provide a detailed set of options for implementing actions at the local or project level, but rather to enable agencies to identify key vulnerabilities across their programs, set priorities, and begin to take action. The core elements of the flexible framework are as follows:

- *Set mandate.* Effective adaptation planning and implementation requires a mandate with clear objectives and metrics. This step of the flexible framework asks, “What are our goals?” and “What is success?” These questions must be answered in the context of each agency’s missions and operations. Agencies should establish leadership-level directives that are tailored to agency missions.
- *Understand how climate is changing.* At this step, agencies should answer the following types of questions using the best-available science: “What aspects of the climate are changing and over what timescale? What uncertainties are associated with projected impacts of climate change in the context of other stresses, and how can we build this uncertainty into our adaptation efforts?” This may also require consideration of low-probability but high-impact scenarios.
- *Apply to mission and operations.* Agencies should ask at this step “What do these changes mean to us?” Agencies’ answers to this question specifically consider the risks, vulnerabilities and opportunities posed by climate change to agency missions and operations. Agencies can build on their experience and skill in decision making in the face of uncertainty as they rely on the best-

available science to consider potential impacts on their mission and operations in the context of existing stressors.



**Figure 5. Six step approach to climate change adaptation planning**

- *Develop, prioritize, and implement actions.* Agency decision makers must face the question of “How should we respond?” To answer this question, agencies must consider a comprehensive set of potential climate adaptation measures – including infrastructural, technological, behavioral, and risk management measures. Criteria for selecting priority adaptation activities and projects will vary from agency to agency, and it is difficult to provide a comprehensive list that will be applicable and realistic for each Federal agency.
- *Evaluate and learn.* Successful climate adaptation requires ongoing monitoring and evaluation of adaptation planning efforts to continually assess the effectiveness of actions and adjust as necessary. Because of the uncertainties inherent in projecting future climate conditions, impacts, and responses, adaptation cannot be simply a policy or action that requires a one-time change. All adaptation plans must allow for a “feedback” mechanism, whereby new knowledge and information, lessons learned (including costs of implementation), and modified priorities can be

accounted for and incorporated into the ongoing adaptation process. Performance metrics should be developed and used to determine whether desired outcomes are being achieved.

- *Build awareness and skills.* Building awareness and skills is central to ensuring the sustainability of adaptation planning, implementation, and evaluation. This element builds agency capacity for ongoing monitoring, assessment, and management of climate effects, responses, and adaptation. Building awareness and skills will require education and training, role models, enabling structures, and a compelling narrative or mandate.

Several pilot tests of the flexible framework are currently underway – from agency-wide to the individual project level. The Department of Homeland Security (DHS) is conducting a high-level, agency-wide pilot with its agency components. DOT is conducting a pilot through the Federal Highway Administration (FHWA) that will be tested at the state or Metropolitan Planning Organization level. EPA is conducting a community-level pilot in Iowa, involving other Federal, state, and local agencies. The U.S Army Corps of Engineers (USACE) is performing several project-level pilots in representative business areas at different phases of the project lifecycle and range of scales.<sup>13</sup>

**Recommended Action: Use a phased and coordinated approach to implement agency adaptation**

Most Federal agencies will take a phased approach to implementing adaptation planning based on the risks and capacity unique to each agency. Agencies may have to first consider the climate change adaptation planning process at a conceptual level in order to build awareness and to make the case internally for prioritizing these issues before investing in the development of a strategic plan. During an initial phase, agencies could be asked to produce a high-level plan, identify priority areas, set goals for adaptation efforts, and identify their own performance metrics moving forward.

This phased approach does not mean that agencies should wait to take advantage of relevant opportunities. Targeted, near-term adaptive actions should be advanced even as broader, long-term planning efforts are undertaken. For example, in metropolitan areas, HUD can assess building codes and other guidelines for implementation of housing adaptation strategies that address low- and moderate-income housing among other changing housing needs. DOT can develop methods to include climate risk analysis in transportation investment policies, promote vulnerability assessments, and assess and update,

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<sup>13</sup> Details of these projects are provided in Appendix G.

as needed, transportation design standards. DOE can work with utilities and other electricity generators to assess water requirements and implications for local water supplies, and provide more precise answers to the questions that decision makers must resolve when dealing with the intertwined issues of climate, water, and energy. Similarly, programs like the National Flood Insurance Program (NFIP) in the Federal Emergency Management Agency (FEMA) can explore a range of approaches to encourage people, communities, and businesses to shift away from high-risk coastal areas and account for future risk in the administration of the Program.

The adaptation planning process of individual agencies should catalyze and support enhanced coordination across Federal agencies. As agencies identify priority areas and set their goals for climate

*“[The Federal Government should] use the precautionary principle to encourage cities to plan for greater uncertainty and variability when building green and grey infrastructure by asking [Request For Proposal] respondents to describe how their planned projects adapt to climate change.”*

– Joyce Coffee, City of Chicago at the Chicago public outreach meeting

change adaptation, they should consult with other agencies that share equities and common concerns, particularly in areas that are cross-cutting. Agency plans should, as appropriate, describe how other agencies were consulted, articulate specific plans for collaboration, and identify areas in which targeting of a different part of the issue by another agency represents the most effective approach to a given problem. Federal agencies’ regional offices should also be engaged as they often have the most direct involvement at

the intersection of climate impacts and Federal, local, state, Tribal, and regional actors. An agency’s regional offices should coordinate with the regional offices of other Federal agencies in the context of their agency adaptation planning process (see the Goal 5 recommended action on regional adaptation consortia).

## **GOAL 2: IMPROVE INTEGRATION OF SCIENCE INTO DECISION MAKING**

Integrated, interdisciplinary science is critical for understanding and envisioning a range of potential climate impacts, informing adaptive actions, and evaluating the effectiveness of response options. Federal agencies should provide tools to enable the science, as well as the translation and communication of that science, to meet the needs of information users (e.g., decision makers, planners, resource managers, general public) as they work to reduce the impacts of climate change to infrastructure, ecosystems, and human health and welfare. Using science translation and tools to effectively integrate science into the decision making process will help individuals and institutions confront uncertainties

about future outcomes with improved information about risks and opportunities in order to make informed decisions.

**Recommended Action: Create a “roadmap” of existing Federal science efforts that inform and support adaptation**

Many programs across the Federal Government produce science that informs and supports climate change adaptation decision making. Many of these efforts occur through the agencies of the USGCRP, while others have emerged in resource management or community development programs through agencies that have not historically focused on climate change. Currently, most of these activities are occurring independently of one another, leading to gaps and redundancies. These efforts would benefit from enhanced coordination on science at the Federal level, through agencies working together more closely to leverage existing capabilities. Coordination would help Federally sponsored science identify, understand, and meet the needs of decision makers implementing adaptation strategies on the ground.

The new Adaptation Science and Research Element within the USGCRP should develop a “roadmap” that identifies existing adaptation science and service capabilities and gaps across Federally-sponsored programs. The roadmap will help to identify existing and emerging connections across Federal agencies that share responsibilities, and between Federal agencies and their local, state, Tribal, or international partners. This activity will need to be coordinated across all Federal agencies, not just those currently under the USGCRP, with particular attention on identifying relevant non-Federal partnerships that agencies consider critical to their adaptation work. The “roadmap” should also build upon the efforts of the Task Force’s Adaptation Science Workgroup over the past year to identify key issues related to science that supports adaptation decisions. In addition, the “roadmap” should include all relevant science fields required for adaptation efforts, including disciplines beyond the traditional physical “climate science” such as social and behavioral sciences and ecology, as well as interdisciplinary efforts.

**Recommended Action: Prioritize activities that address science gaps important to adaptation decisions and policies**

The Federal Government should prioritize scientific activities that address critical gaps in understanding to better inform and support adaptation decisions. USGCRP should consider options for identifying and expanding opportunities to address these gaps through interagency coordination and its strategic planning process. Key actions to address science gaps identified include:

- Develop scenarios of a range of climate change outcomes at spatial and temporal scales necessary to inform impact assessment and adaptive action.
- Create user-friendly methods for assessing climate impacts, vulnerability, and risk, including models and tools to assess the environmental, social, and economic outcomes of alternative adaptation actions.
- Provide guidance on the use and suitability of downscaled global climate model outputs.
- Conduct frequent updates of regional characterizations and assessments of climate, including climate-driven variables (e.g., stream flow, flood, and drought).
- Expand research on relevant social and behavioral sciences to improve understanding of human responses to change.
- Identify the social and ecological tipping points and thresholds (beyond which change is sudden and potentially irreversible) to help guide decisions regarding intervention and planning.
- Develop methods and processes for identifying, defining, and managing for extremes, including low-probability, high-impact events.
- Analyze climate change impacts in the context of multiple stressors and interacting systems (e.g., interactions of climate and air quality on human health in metropolitan areas).

*"One thing we know for sure is we're not going to be able to move forward doing this alone. That's the reason the four counties in South Florida have come together [and] agreed to work on modeling in the same way, with the same timelines."*

– Honorable Kristin Jacobs, Broward County Commissioner and Chair, Climate Change Task Force at the Miami public outreach meeting

**Recommended Action: Build science translation capacity to improve the communication and application of science to meet the needs of decision makers**

The Federal Government should enhance its capacity to translate information between scientists and decision makers. Effective science translation will help to ensure that decision makers have the information they need to make decisions on adaptive measures. For example, a municipality would need access to and translation of sea level rise scenarios in order to make an informed decision regarding a long-term investment in sewage treatment infrastructure to prepare for future climate change. Online infrastructure can also support these efforts by improving the accessibility of information and share lessons learned both to and from end users.



Science translation is facilitated by experts who help to connect the information needs of decision makers to best-available science. Rather than continuing the science-led approach to providing climate information, the Federal Government should translate science in a collaborative and multi-directional way. The Federal Government should consider decision makers needs when prioritizing scientific research for science to be useful to adaptation planning.

To effectively integrate and implement adaptation responses, the Federal Government should recruit, develop, and retain technically capable staff that have the proper expertise to understand decision maker needs, and to communicate effectively climate change impacts.

Federal agencies should evaluate their existing ability to deliver and translate science for users and invest in building this capability. There are excellent examples of successful science-to-user continuums from which to learn (e.g., NOAA Coastal Services Center, National Integrated Drought Information System, Federal Climate Change and Water Working Group, Joint Fire Science Program, U.S. Geological Survey (USGS)/U.S. Fish and Wildlife Service (USFWS) wildlife impact collaborations). The USDA Cooperative Extension and NOAA Sea Grant Extension currently provide extension agents of all specializations with training in understanding and communicating climate change information to support adaptation; these efforts should be expanded. Translation can provide extremely useful connections between practical management challenges and the best-available science.

**Recommended Action: Explore approaches to develop an online data and information clearinghouse for adaptation**

Agencies within the Task Force are in the early stages of an effort to adapt the NOAA Climate Services Portal prototype, currently hosted at Climate.gov, into an operational interagency online portal that brings together climate science and services information from across the Federal Government. Climate.gov is an easily identifiable, authoritative online source of climate information where the public can access data, tools, and informational resources to help them understand climate science as well as options for adaptation and mitigation.

These agencies should also work together with the NCA to identify the necessary components of an online data and information clearinghouse for adaptation, including next steps for development and implementation, and a mechanism for the ongoing maintenance and updating of this resource. They should evaluate the appropriate roles for the Federal Government in identifying, compiling, and

enhancing data collection efforts across the Government on key climate impact indicators, as well as catalyzing, developing, and supporting these clearinghouse components over the long-term. In addition, potential roles for private and public partners should be explored. Components could include: scientific information, transferable decision-support tools, best practices, relevant contacts from adaptation activities across the Nation, and an active support mechanism to facilitate dialogue among users.

### GOAL 3: ADDRESS KEY CROSS-CUTTING ISSUES

Given the breadth of climate change impacts and corresponding adaptation measures, certain key climate-related issues will require a collaborative approach from the Federal Government, such as water resource management, public health activities, community resilience, and insurance risk assessment. Such adaptation issues cut across the jurisdictions and missions of individual Federal agencies and will require extensive coordination and partnerships at the local, state, Tribal, regional, and international levels. For these cross-cutting adaptation issues, a collaborative approach is necessary to ensure that adaptation



**Water resource managers will need to cope with prolonged drought in some areas due to climate change.**

actions are timely, do not duplicate the work of other Government agencies, fill critical gaps, and maximize the returns on the Federal Government's investments in adaptation.

The Task Force began addressing cross-cutting issues through an initial set of issue-focused workgroups: water resource management, public health, resilient communities<sup>14</sup> and the role of insurance. While these issues are all critically important, they were selected based on existing interest and capacity

to serve as venues for interagency dialogue. Additional cross-cutting issues will need to be addressed in a comprehensive national approach to adaptation. Moving forward, the Task Force will work to identify, prioritize, and address these issues. The recommended actions described below reflect the work of the issue-focused workgroups on the topics addressed in the initial year of the Task Force's activities.

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<sup>14</sup> While the Urban Workgroup originally focused on urban issues, the Task Force recognized that the recommendations they developed were broadly applicable to all communities.

**Recommended Action: Improve water resource management in a changing climate**

A changing climate is expected to have major consequences for the Nation’s water resources. On average, water temperatures are predicted to increase. Rainfall amounts will decline in some areas and increase in other areas.<sup>15,16</sup> The proportion of precipitation that falls as snow will decrease; and rainfall and storm events will become more intense. In the case of coastal and ocean waters, the impacts of climate change include rising sea levels, more saline estuarine waters, and more acidic ocean waters.<sup>17,18</sup> These impacts are already posing significant challenges for water resources management in several major areas: assuring adequate water supply (e.g. for drinking water, agriculture, irrigation, energy, etc.); protecting human life, health, and property; and protecting the quality of freshwater resources.

The Task Force’s Water Resource Workgroup has identified the following actions to improve water resource management in a changing climate:

*“We farm a ground that my grandfathers had farmed. This is not just a job or even a career – this is a legacy, a life.... And just one year could wipe all of that out. So we take these [climate change adaptation] policies and these issues very seriously.”*

– Wayne Hurst, Vice President, National Wheat Growers Association at the Denver public outreach meeting

***Strengthen data and information systems for understanding climate change impacts on water.***

DOI is leading an interagency effort to build a national system that will describe the changing availability, quality, location, and uses of water resources. This information system should be organized by watershed and made available to water managers and the public.

The effort should include evaluation of these water data as needed to provide water resource managers and engineers engaged in infrastructure planning, water management decisions, ecosystem protection, and flood hazard mitigation with the interpretative “hydrostatistics” that are needed to make good decisions as hydrological conditions change over time. Examples of these statistics include precipitation frequency estimates, probable maximum precipitation estimates, and streamflow estimates for multiple time scales.

<sup>15</sup> *Global Climate Change Impacts in the United States*, Karl, Thomas R., Melillo, Jerry M., Peterson, Thomas C., (2009).

<sup>16</sup> *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Parry, M.L., Canziani, O. F., Palutikof, J. P., van der Linden, P. J., et. al., contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change 2007 (2007).

<sup>17</sup> *Global Climate Change Impacts in the United States*, Karl, Thomas R., Melillo, Jerry M., Peterson, Thomas C., (2009).

<sup>18</sup> *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Parry, M.L., Canziani, O. F., Palutikof, J. P., van der Linden, P. J., et. al., contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change 2007 (2007).

Actions needed to strengthen data and information systems for water in response to a changing climate will be described in more detail in a Report to Congress in March 2011, as required under Section 9506 of the Omnibus Public Lands Act.

***Improve water-use efficiency to reduce climate change impacts.***

Increasing water-use efficiency helps to extend the availability of current supplies, save energy, reduce the cost of water system operations, maintenance, and replacement, protect the environment, and prepare for increased climate-driven variability in the hydrologic cycle. Key steps to improve water-use efficiency may include:

- Establishing nationally consistent metrics of water-use efficiency for municipal water systems, energy producers, irrigation suppliers, and other users of water, and defining a mechanism to make these data transparent and readily available to decision makers and the public;
- Revising existing Federal guidelines related to environmental assessments required under both the National Environmental Policy Act and the “Principles and Standards” that guide Federal water resource projects to more clearly address opportunities for water-use efficiency and water reuse;
- Identifying and sharing examples of excellence in improving water-use efficiency, and developing and deploying innovative and cost-effective water-efficient technologies in key water use sectors (e.g., drinking water, agriculture, irrigation, energy) and regions of the country as a means to facilitate wider adoption of practices.

***Develop a national action plan to strengthen climate change adaptation for freshwater resources.***

A national action plan should be developed to ensure an effective, well-coordinated, and sustained approach to adapting the Nation’s freshwater resources to a changing climate. The existing Task Force Water Resources Workgroup should lead the development of this adaptation plan. The Workgroup should engage a diverse range of stakeholders in this effort through the existing DOI *Advisory Committee on Water Information* and work with regional coordination partnerships wherever available. The Workgroup should also coordinate with existing interagency organizations, such as the National Science and Technology Council’s *Subcommittee on Water Availability and Quality* and the *Climate Change and Water Working Group*, on issues related to water science and research. In addition to developing the action plan for freshwater resources, the Workgroup should oversee related activities including the development of the Report to Congress on water resources data and information needs related to climate change and expanded efforts to improve water use efficiency described above.

The freshwater action plan should be coordinated with the National Ocean Council's efforts for coastal and ocean water resources as described in the *Final Recommendations of the Interagency Ocean Policy Task Force*, where appropriate.

**Recommended Action: Protect human health by addressing climate change in public health activities**

Climate change has emerged as an important public health challenge, both in the United States and globally. The potential health effects of climate change include heat-related illness and death; injuries, toxic exposures, mental health and stress disorders, and other impacts from severe weather events; cardiovascular and respiratory illnesses from worsening air pollution and allergen exposure; and increased rates of infectious diseases. These effects may be particularly severe for low-income and minority populations, native peoples, children, the elderly, and the physically infirm, among others.

Furthermore, because many health problems cross international borders, global health cannot be separated

from U.S. interests. Adaptive actions must be undertaken to anticipate these changes and avoid or reduce potential harmful health impacts. Since many of the health impacts of climate change in the United States can be addressed by strengthening existing public health systems, health is a critical area where the Federal Government can implement "no regrets" policies and actions. Specific actions that the Federal Government can take to manage the public health implications of climate change include the following:

*"[The Federal Government] can empower local health departments by strengthening existing and building new capacity in the areas of public health surveillance, GIS mapping, and conducting vulnerability assessments..."*

– Kari Lyons-Eubanks, Policy Analyst, Multnomah County Environmental Health Services, State of Oregon at the Portland public outreach meeting

***Enhance the ability of Federal decision makers to incorporate health considerations into adaptation planning.***

The Federal Government recognizes that decision makers in all fields should consider the health effects of climate adaptation options in their planning efforts. To achieve the goal of encouraging health analysis as part of adaptation planning, science must be integrated into all levels of decision making. That integration requires the ability to identify and analyze health impacts, which in turn requires methods and standards for conducting the analyses and for determining whether such analyses are sufficient. OSTP, working with the USGCRP, the Department of Health and Human Services (HHS), and others should convene an interagency effort to review current methodologies and standards, their uncertainties and

limitations, and to assist decision makers by developing and providing tools and guidance for determining when and how to consider health impacts.

***Build integrated public health surveillance and early warning systems to improve detection of climate change health risks.***

A critical component of assessing health vulnerabilities to climate change is the ability to collect and analyze data related to health outcomes, underlying vulnerabilities, adaptive capacity, and measures of

*"Sixty percent of the sewer system in Broward County is gravity fed. When the sea level rises and sewage is no longer running downhill, we'll have a lot more believers [calling on us] to do something."*

– Honorable Kristin Jacobs, Broward County Commissioner and Chair, Climate Change Task Force at the Miami public outreach meeting

resilience. Integrating human health data with animal and ecosystem health data is vital to understanding and addressing the complexities of many vector-borne, water-borne, food-borne, and other diseases. Integrating health data with demographic, geographic, and climatic data is also critical for gaining full understanding of underlying vulnerabilities.

Currently, incompatibility of datasets in these different disciplines presents a significant barrier to data integration.

Agencies (including HHS, NOAA, USDA, NASA, DOI) that collect and maintain these datasets should prioritize developing methods to better integrate their datasets to facilitate health analyses. This data integration would allow for development of early warning systems that could improve our ability to detect current and emerging health risks.

***Promote resilience of individuals and communities to climate-related health risks.***

Individual resilience to climate change health impacts may be improved by promoting healthier behaviors, such as increasing physical activity and improving nutrition to respond appropriately to extreme heat and weather events and reducing risks of climate sensitive chronic diseases. Community-level resilience could be enhanced through prioritizing programs to reduce health disparities, particularly among vulnerable subpopulations; strengthening emergency preparedness, response, and recovery functions at the local, state, and Tribal levels; promoting social support systems within communities; and improving infrastructure (e.g., hospitals and other health delivery facilities, drinking water, sewage, transportation, and energy systems). Since this public health-related infrastructure is a long-term investment, ensuring that it is resilient to climate change will best protect health in the decades to come.



**Recommended Action: Build resilience to climate change in communities**

Adaptation planning for communities and their underlying infrastructure is crucial. Federal interest and investment in communities include transportation, housing, water and water infrastructure, health, public safety, emergency preparedness and response, and energy. Investments in community infrastructure are generally long-term, difficult to reverse, and resource-intensive, emphasizing the importance of “getting it right the first time.”

Climate change impacts that will most affect communities – whether urban, suburban, or rural – include extreme heat, poor air quality, increased flooding, higher storm surges, and sea level rise. Reducing vulnerability and enhancing resilience of community infrastructure present challenges that require coordination among public and private interests, local to national jurisdictions, and within localities (e.g., zoning, building codes, and emergency management). Additionally, community decision makers will need to take special care to protect socially and culturally vulnerable populations who are particularly at risk from climate change impacts, including Tribes, low-income and minority populations, children, the elderly, and the physically infirm.



**The Federal Government can provide information and tools to help communities prepare for and respond to climate change impacts, like flooding.**

*“Farmers understand how to manage risks and uncertainty. It is what they do. It doesn’t matter whether you are growing oranges in California or soybeans in Iowa – risk management is a key to profitable farming. Climate change is going to pose risk and uncertainties on a grand scale that, at this point, nobody really knows how to manage with any specificity and it is going to require farmers to develop new adaptation techniques.”*

– Rob Neenan, Vice President for Environmental Affairs and Sustainability, United Fresh Fruit & Vegetable Association at the Denver public outreach meeting

Specific measures the Federal Government should consider to increase the resilience of communities and critical infrastructure include the following:

***Ensure relevant Federal regulations, policies, and guidance demonstrate leadership on community adaptation.***

As communities rise to the challenge of adapting to climate change, Federal agencies should harmonize existing policies and adaptation efforts at the local, state, Tribal levels. Examples of proactive agency efforts include the following:

- DOT could assess the adequacy of transportation design standards, such as the “Greenbook,”<sup>19</sup> in light of future climate conditions;
- HUD, in coordination with DOE and EPA, could provide guidelines or update building codes for implementation of housing adaptation strategies that address low- and moderate-income housing among other changing housing needs;
- NOAA could expand the development of tools, services, and training which provide guidance on adaptation in coastal communities;
- EPA could establish approaches for integrating projected climate change impacts into drainage risk management and the design and management of drinking and waste water treatment plants;
- USACE could provide climate change guidance for flood and storm risk management plans; and
- FEMA could update its flood insurance maps to reflect climate change.

*“We are working hard to promote “green” (ecosystem-based) adaptation – actions that have the goal of making both people and wild species more resilient to climate change by reducing stressors on, and restoring, natural systems. In many cases, we are working with new collaborative partners, like stormwater engineers, or corporations with goals to reduce their water footprint. Our work could greatly benefit from programs that provide incentives or preferences for adaptation actions that incorporate investments in natural systems, and for partnerships that actively involve conservation/restoration practitioners.”*

– Kim Hall, The Nature Conservancy Great Lakes Project at the Chicago public outreach meeting

State, Tribal, and local representatives, through improved partnerships with the Federal Government (See Goal 5), will play an important role in informing these Federal efforts.

***Integrate adaptation considerations into Federal programs that affect communities.***

The Federal agencies should coordinate planning processes and programs that determine Federal investments in housing, transportation, environmental protection, and hazard mitigation in metropolitan areas. They should also integrate adaptation measures into these processes and programs. To facilitate interagency cooperation on community adaptation, grant programs could be jointly issued or reviewed by multiple agencies. Coordination could be supported through an interagency Memorandum of Understanding or by designating an entity to oversee coordination (e.g., CEQ, a workgroup under USGCRP, or the White House Office of Urban Affairs). One example of successful interagency coordination to assist communities is the Partnership for Sustainable Communities, a joint collaboration of DOT, HUD, and EPA. Additionally, agencies such as EPA, HUD, DOT, NOAA, and DOE that have existing programs focused on community resilience should work collaboratively in conducting pilot

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<sup>19</sup> <http://www.greenbookspeccs.org/>



projects to deliver direct technical assistance to individual communities that can then serve as models for other areas.

**Recommended Action: Facilitate the incorporation of climate change into insurance mechanisms**

The effects of climate change are already clearly understood by public and private insurers. At the Federal level, two major public insurance programs are already affected by climate change and will require adaptive actions:

- FEMA, within the Department of Homeland Security (DHS), administers the NFIP which enables property owners in participating communities to purchase insurance protection against losses from flooding.
- The Risk Management Agency, within USDA, administers the Federal Crop Insurance Corporation, which provides crop insurance to farmers.

Private insurers investing in climate-vulnerable industries are already experiencing greater losses. This is affecting the availability and affordability of insurance. Insurance markets may have insufficient capital to cover increasing catastrophic losses, especially if rates cannot track climate risks.

When accurately priced to reflect risk, insurance can provide an important signal to customers (including homeowners, farmers, coastal communities, and businesses) and create incentives for adaptation.

However, inaccurate pricing signals, including those that do not incorporate climate risk, can hinder effective adaptation. When considering insurance policy, it is also important to recognize that disaster insurance provides an important safety net for low-income and minority populations, whose residential options are sometimes limited and who may lack the means to relocate.

***Explore a public/private partnership initiative to produce an open-source risk assessment model.***

Current risk assessment modeling for the insurance sector is characterized by limited capacity among stakeholders, uncoordinated spending on models, and a lack of transparency. Insurers, reinsurers, and state and non-governmental representatives agree that there is an opportunity to partner with the Federal Government on modeling to address these concerns.

An open-source community model addressing the risk of catastrophic events (such as coastal storms) and persistent and sub-catastrophic events (e.g., droughts, wildfires, and floods) in a defined geographic area across residential and commercial sectors (e.g., energy, water, transportation) will foster improved data

quality and sharing, create more realistic risk-based pricing signals for public and private insurance, and create public awareness. The opening step for this initiative is a feasibility study to assess project requirements and outcomes, followed by initial design or scoping of a model. This initiative is related to and complements findings identified by two recent government-wide efforts.<sup>20,21</sup>

**Recommended Action: Address additional cross-cutting issues.**

The Task Force recognizes that a National approach to adaptation will need to consider additional cross-cutting issues. The Task Force selected the cross-cutting issues discussed above based on existing interest and capacity for interagency dialogue. The Task Force has identified two additional areas that cut across sectors and agencies for further study in the near term, recognizing that there are many high priority sectors that will ultimately need to be addressed:

- Coastal and ocean resilience; and
- Fish, wildlife, and plant resources and their habitats.

In the past year, the Obama Administration and Congress also recognized the importance of these two cross-cutting adaptation issues through an Executive Order and legislation, respectively. Interagency efforts to address these issues are already underway and can both inform and learn from the ongoing work of the Task Force. In addition to coordinating with and supporting these initiatives, the Task Force will continue to identify other cross-cutting issues (e.g., energy, agriculture, infrastructure) and prioritize those to address.

Over the next year, the Federal Government should work to:

***Develop a strategic action plan focused on strengthening the resilience of coastal, ocean and Great Lakes communities and ecosystems to climate change.***

Coastal and ocean environments both influence and are affected by a changing climate. The global ocean influences the Earth's climate and climate variability, while coastal and ocean environments are vulnerable to climate change impacts including sea level rise, increased severe storm events, erosion, water supply issues, and ocean acidification. These impacts will affect human populations, infrastructure, ecosystems, and biological diversity, as well as the valuable ecosystem services provided by the Nation's oceans, Great Lakes, and coasts.

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<sup>20</sup> Opportunities for Interagency Collaboration and Coordination on Modeling for Coastal Inundation Hazard Reduction, National Science and Technology Council, Subcommittee on Disaster Reduction (2010).

<sup>21</sup> Sea Level Rise and Inundation Community Workshop, Ocean Research and Resources Advisory Panel of JSOST (2009).

On July 19, 2010, President Obama signed an Executive Order establishing a National Ocean Policy that adopted the *Final Recommendations of the Interagency Ocean Policy Task Force*.<sup>22</sup> Acknowledging the vulnerability of ocean and coastal resources to climate change, one of the nine priority objectives for improving coastal and ocean stewardship the *Final Recommendations* identify is to “strengthen resiliency of coastal communities and marine and Great Lakes environments and their abilities to adapt to climate change impacts and ocean acidification.” Under the Executive Order, the interagency National Ocean Council is tasked with developing strategic action plans for each priority objective within one year. Per the *Final Recommendations*, strategies will be developed to reduce the vulnerability, increase the resilience, and improve the adaptation of human and natural systems to climate change impacts.

The Task Force supports this effort, and recommends that the Interagency Policy Committee and planning effort include the appropriate expertise and input from local, state, Tribal, and Federal governmental and non-governmental partners. As noted above, this work should be coordinated with the development of a national action plan to support adaptation of freshwater resources to a changing climate, where appropriate. The National Ocean Council and the Task Force should coordinate with one another on a periodic basis to share progress and findings.



**Ecosystem-based adaptation strategies, such as protecting coastal wetlands to reduce damages from flooding, can improve resilience to climate change.**

***Develop a strategy for reducing the impacts of climate change on the Nation’s fish, wildlife, and plant resources and their habitats.***

It is clear that effective adaptation to climate change within the United States will depend on reducing the vulnerability and increasing the resilience of ecosystems, through adopting ecosystem-based adaptation strategies that focus on the continual provision of essential ecosystem services such as water supply, coastal protection, and carbon sequestration. Achieving this goal requires collaboration among the Federal Government, states, Tribes, non-governmental organizations, private industry, and private landowners to work together in new, expanded, and interdependent ways to successfully help species, habitats, and the communities and economies that depend on them adapt to a changing climate.

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<sup>22</sup> Final Recommendations of the Interagency Ocean Policy Task Force, White House Council on Environmental Quality, (2010).

In the Fiscal Year 2010 Appropriations Act, Congress specifically called for the development of a National Fish, Wildlife, and Plants Climate Adaptation Strategy (NFWPCAS) by 2012. CEQ and DOI (with the USFWS as lead) were tasked to develop a national, Government-wide strategy that provides a unified approach – reflecting shared principles and science-based practices – for action by governmental and non-governmental organizations to reduce the impacts of climate change on the Nation’s species, habitats and ecological processes. The USFWS, working with a number of other agencies, has already taken several steps to begin developing the Strategy including drafting NFWPCAS Purpose, Vision, Guiding Principles, and Key Components documents, and holding eight listening sessions to seek input from stakeholders and the public.

The Task Force supports CEQ and USFWS’s efforts to develop the NFWPCAS, and recommends that a formal process be established, including the formation of a steering committee or workgroup, as appropriate, to draw on expertise and input from state, Tribal, and Federal governments and non-governmental partners in its development. This group and the Task Force should coordinate on a periodic basis to share progress and findings. Since the NFWPCAS will address adaptation of species and habitats in terrestrial, freshwater, coastal, and near-shore marine environments, development of the strategy should be coordinated with the National Ocean Council priority objective on coastal, ocean and Great Lakes resiliency and adaptation to climate change and ocean acidification.

#### **GOAL 4: ENHANCE EFFORTS TO LEAD AND SUPPORT INTERNATIONAL ADAPTATION**

Climate change poses particularly challenging risks and opportunities that are important to many of the U.S. Government’s international development, security, and diplomatic priorities. Addressing climate change is one of the Administration’s priority development initiatives and supports the President’s new Global Development Policy. Developing countries are disproportionately affected by climate change because they are the most vulnerable and least able to cope with changing climate conditions and extreme weather events. Climate change also magnifies or contributes to other global development challenges, such as water, food, and energy security, public health, and biodiversity protection, among others. From a national security perspective, climate change may act as an “accelerant of instability or conflict.”<sup>23</sup>

Climate change vulnerability is increasingly a political priority for many developing countries, a trend that is likely to continue as climate impacts become more acute. Adaptation is a key component of the

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<sup>23</sup> U.S. Department of Defense Quadrennial Defense Review Report, Department of Defense, (February, 2010)

December 2009 Copenhagen Accord and will continue to be an integral part of the global climate change negotiations. The United States has an opportunity to provide leadership for this emerging development and foreign policy issue. The Administration has placed renewed emphasis on climate change in its foreign assistance programs, and is working to integrate climate adaptation planning into a range of relevant development activities. Adaptation is one of three core “pillars” of the Administration’s international climate budget.<sup>24</sup>

The United States should adopt an integrated and long-term approach that leverages the full technical capacities of the Federal Government to demonstrate leadership on international adaptation as this issue gains greater prominence in coming years. In particular, the Federal Government should build on existing adaptation programs and practices to: develop a Government-wide strategy for supporting multilateral and bilateral adaptation activities and integrating climate change adaptation into relevant U.S. foreign assistance and international activities; improve coordination and collaboration among international development, national security, and technical support agencies; and strengthen engagement with global partners to stimulate knowledge sharing and innovation, coordinate investments, and leverage local expertise and knowledge.

**Recommended Action: Develop a Government-wide strategy to support multilateral and bilateral adaptation activities and integrate adaptation into relevant U.S. foreign assistance programs**

The Administration has worked to develop an appropriate mix of multilateral and bilateral funding toward the United States’ contribution to meet the financing commitments made by developed countries in Copenhagen. It has also taken steps to prioritize vulnerable countries and populations and to promote the integration of adaptation into broader development activities. These efforts are focused on improving the dissemination of information to help identify the greatest vulnerabilities to climate change, helping developing countries create governance systems that are inclusive, transparent, and responsive to the needs of their constituents, and implementing climate solutions that are locally appropriate and increase the resiliency of the world’s most vulnerable populations.

The Department of State, USAID, and Department of the Treasury have developed substantial adaptation initiatives and are beginning to integrate adaptation planning into core development programs, such as the Administration’s global hunger and food security initiative (Feed the Future). Several other agencies, such as the Millennium Challenge Corporation (MCC), USDA, DOE, EPA, USACE, USGS, USFWS,

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<sup>24</sup> <http://www.state.gov/documents/organization/140689.pdf>



Prolonged droughts due to climate change will impact global food security.

and NOAA provide important expertise and resources that complement or directly support core adaptation objectives. The Department of State, USAID, and Department of the Treasury, working closely with other relevant Federal agencies, should develop a Government-wide strategy that builds on and enhances on-going adaptation efforts, supports the core principles and objectives of the President's new Global Development Policy, and coordinates resources and expertise across the Federal Government to support international adaptation initiatives.

Specifically, strategic objectives should include investments that help developing countries strengthen their capacity to conduct risk and vulnerability assessments, improve environmental governance, and integrate adaptation planning into core economic development programs (e.g., infrastructure, agriculture, energy, health, natural resource management, tourism). A standard set of definitions, performance metrics, and reporting criteria should be developed to guide and track U.S. Government contributions to international adaptation, including both bilateral and multilateral investments. Integrated approaches that foster synergies between climate change adaptation and mitigation<sup>25</sup> should be encouraged, where possible.

**Recommended Action: Enhance collaboration on adaptation among international development, national security, and technical support agencies**

To support a government-wide strategy for international adaptation, agencies should enhance collaboration on global climate change issues to better leverage the expertise and resources available, such as those from NOAA, USDA, USGS, EPA, DOE, and others. These agencies, though largely domestically focused, provide critical expertise, science, technology, and other tools that can be used in an international context for development planning and national security analysis. Furthermore, many technical agencies are already engaged in international climate adaptation efforts through global partnerships such as the United Nations and the World Meteorological Organization. Historically, collaboration between development and technical agencies on international climate issues has been limited. Collaboration could be greatly improved by building greater awareness within and

<sup>25</sup> Mitigation includes investments in clean energy and sustainable landscapes. Separate initiatives are being led by the Department of State and USAID to support low emissions development strategies and reductions in emissions from deforestation and forest degradation (REDD+).



outside of the Federal Government of the full range of capabilities and resources that technical agencies can provide to support international adaptation. Development agencies are generally not aware of the full scope of technical and scientific services available elsewhere in the Government that could be utilized in an international context. Similarly, technical and scientific agencies do not have a complete understanding of the data and information needs that exist in the development and national security agencies. The Government Accountability Office (GAO) and OMB have done an initial survey of adaptation capabilities within the Government, but a more comprehensive survey focused specifically on international capabilities and needs should be considered to help promote better alignment between the producers and consumers of international climate information. Agencies should consider how to best make this information available to development practitioners and scientists within and outside the Government. One option is to provide this information through an online information clearinghouse such as that recommended under Policy Goal 2.

Further, the national security and development communities should coordinate adaptation and analytic efforts to enhance the Federal Government's ability to meet its development objectives and mitigate national security risks. While the development and national security communities have different missions, they are linked by a common interest in the stability and wellbeing of developing countries and their populations. They also have a common need for the expertise and resources available from technical agencies. Timely and appropriate exchange of information and analyses between the national security and development communities will help ensure the effectiveness of Federal efforts on international adaptation and can provide insights into security risks that may be magnified by climate change.

**Recommended Action: Engage global development partners and the private sector to promote knowledge sharing and coordinate investments**

The United States should enhance interaction and cooperation with global development partners and the private sector to promote improved knowledge-sharing and the scaling up and dissemination of best practices to help developing countries reduce their vulnerability to climate change. Given the need to meet a growing challenge with a finite set of resources, it is vital to coordinate and leverage investments where possible to maximize adaptation and development outcomes and ensure resources are directed toward the greatest needs and priorities.

In addition to bilateral assistance, the United States should continue to support adaptation through multilateral assistance programs, which allow the United States to leverage the resources of other donors



as well as help other countries learn from these efforts and promote best practices. The United States contributes significantly to international climate adaptation efforts through its leadership in the Intergovernmental Panel on Climate Change, the Global Framework for Climate Services, and the Global Earth Observation System of Systems. Furthermore, the United States is actively engaged with other key donors and international institutions to coordinate efforts, deepen communication, and synthesize lessons learned as the United States and others scale up adaptation efforts in vulnerable countries and communities around the world.

The United States should also expand partnerships with the private sector. Leveraging the expertise, capabilities, and investments of the private sector mobilizes additional financial and technical resources that can help magnify the scope and impact of public sector investments. The Department of State Global Partnership Initiative and USAID's Global Development Alliance are actively working to strengthen public-

private partnerships that tap into the expertise and leadership of the private sector to advance international adaptation objectives. For example, USAID and NASA have developed partnerships with private technology companies for satellite-based regional forecasting systems in Central America and Africa (known as "SERVIR") that can be used to assess future impacts of climate change.

The Global Development Alliance and the Global Partnership Initiative should continue to explore opportunities for public-private sector partnerships that help build adaptive capacity internationally and support U.S. global development priorities. Specifically, there are significant opportunities to work with the financial services sector to spur further innovation and development of international adaptation financing and risk management strategies, including micro-insurance products. The United States should also seek to scale up initiatives to improve global climate data and knowledge management systems that increase the consistency, quality, and availability of scientific information. Public-private partnerships can also be beneficial to improving public messaging and communication about the importance of adaptation. To that end, the Federal Government should be transparent, and proactive in providing timely and relevant information on its support of international adaptation to the public.

*"We recommend the cross-sector use of ecosystem-based approaches to adaptation planning; not only for the benefit of wildlife and plants, but also in support of human and built environments. Ecosystem-based adaptation complements other man-made climate change responses by increasing the resilience of ecosystems so they can continue to provide the full suite of benefits people rely on such as simultaneously sustaining biodiversity. While certain hard infrastructure responses to climate change will be needed, it is clear that effective long-term adaptation to climate change will depend on reducing the vulnerability and increasing the resilience of ecosystems and their essential services."*

– The Nature Conservancy, Hawai'i Chapter at the Hawaii public outreach meeting

## GOAL 5: COORDINATE CAPABILITIES OF THE FEDERAL GOVERNMENT TO SUPPORT ADAPTATION

As described throughout this report, the Federal Government already invests resources to provide climate science and services, technical support, and training to inform adaptation efforts at all scales. During the past year, stakeholders at local, state, Tribal, and regional levels requested that the development and delivery of these resources be better integrated to provide more efficient and effective support for adaptive action at all scales. The Federal Government needs to improve coordination of its science, services, and assessments programs to better enable stakeholders to access and leverage these resources in order to support decisions that enhance the resilience of communities, ecosystems, and the economy. The ongoing alignment of these activities is critical to achieve desired adaptation outcomes, ensure efficient deployment of Government resources, and respond to the evolving needs of stakeholders.

The National Climate Assessment (NCA) provides a valuable opportunity to engage with stakeholders and partners nationally and internationally, identify gaps in the Federal Government's ability to support adaptation, and better align and coordinate Federal capabilities. The third NCA is currently being developed, including a new approach to provide a continuing mechanism for engaging communities and networks of stakeholders at the local, state, Tribal, and regional levels. These stakeholders will collaborate with the Federal Government to produce information on assessing climate change impacts, vulnerability, and the capacity to prepare and respond. These assessments will help to identify science and service needs for understanding and adapting to regional and sectoral climate risks. The next NCA report is due in June 2013, and this ongoing assessment process, required by the Global Change Research Act of 1990, could provide an iterative evaluation of progress in the Nation's adaptation efforts, as well as an important mechanism for information exchange and engagement.

*"We have to bring the partners together. We have to bring the stakeholders together and perhaps at the Federal level there's a way to look at how monies flow to communities so we get out of our silos and talk to each other and begin to plan together."*

– Dr. Kevin Sherin, Orange County Health Department, State of Florida at the Portland public outreach meeting

In addition, the Task Force has identified three actions to improve the responsiveness and effectiveness of Federal efforts by building partnerships, coordinating efforts at the regional scale, and continuously evaluating the success of the Federal government in supporting adaptation at the national scale.

**Recommended Action: Build and maintain strong partnerships to increase responsiveness of Federal Government activities to support local, state, and Tribal needs**

Maintaining an open dialogue between Federal and non-Federal decision makers is critical to successful adaptation planning and implementation. The Task Force should establish a partnership committee composed of local, state, Tribal, and Federal Government representatives to exchange information and views on adaptation needs. This committee will be tasked with identifying how agencies can best coordinate and engage with stakeholders on an ongoing basis, as the Federal Government continues to enhance its support of adaptation efforts at various scales. This committee will increase engagement with non-Federal partners and serve as a venue for discussing the implementation of Federal policy and actions on cross-cutting adaptation issues. The work of this committee over the next year will provide the foundation for sustained and robust dialogue to better leverage, coordinate, and support U.S. adaptation efforts in the future. In addition to this committee, the Task Force will continue to engage with other non-governmental, private sector, and community-based organizations and networks. Agencies on the Task Force will also engage in ongoing dialogues with non-Federal partners as they work to develop agency-specific adaptation plans, provide accessible information and tools, foster local-to-global collaboration, and address stakeholder needs.

**Recommended Action: Develop regional climate change adaptation consortia among Federal agencies**

Many Federal agencies have regional offices and programs through which they actively engage with extensive networks of partners at the local-to-regional scale. Harmonizing efforts at the regional scale benefits both decision makers and information providers by avoiding duplication of efforts and leveraging existing capabilities. Federal agencies that work at the regional scale should consider how the range of programmatic activities already underway, from outreach to data collection, and research to information dissemination, meet the needs of stakeholders in the region. These efforts should build off of and strengthen existing regional networks. In addition, they should be considered on a region-by-region basis, as vulnerabilities, cultures, and agency responsibilities can vary across regions. Regional coordination will foster collaboration on the many science and service activities emerging across Federal agencies. Furthermore, a regional emphasis will create opportunities for improving the accessibility of existing science as well as responding to evolving information needs.

The potential benefits of regional adaptation consortia include the following:

- Allow the Federal Government to learn from the adaptation efforts of regions, states and communities across the country.
- Facilitate Federal/non-Federal partnerships to leverage the resources of existing institutions, organizations, and networks.
- Provide practitioners with better access to information and technical assistance to support adaptation efforts at local-to-regional levels.
- Streamline and integrate monitoring information on local-to-regional impacts of climate change and build online access for sharing this information in a consistent and accessible format.
- Support activities of the NCA.
- Provide opportunities to develop region-specific guidance in support of adaptation planning and implementation.
- Enhance coordination among the regional offices of Federal agencies in the context of their agency adaptation planning processes (i.e., Policy Goal 1).
- Support the preparation, implementation, and evaluation of state and local climate change adaptation plans.

**Recommended Action: Establish performance metrics for evaluating Federal adaptation efforts**

Regular evaluation of the Federal Government's adaptation efforts is critical to continuously refining and improving adaptive approaches. An iterative evaluation process will allow adaptation plans, priorities, and actions to be revised as necessary if desired outcomes are not being achieved or if undesired consequences are occurring. The development of metrics of success for adaptation efforts is complex and challenging. Therefore, the Task Force will engage a variety of groups, such as the proposed partnership committee and the new Adaptation Science and Research Element of the USGCRP to discuss options. These groups should focus on high-level goals and performance metrics that look across Federal adaptation efforts at interagency, national, and international scales. This effort will complement the agency-level goals and performance metrics that will be developed as part of the agency adaptation planning process (Policy Goal 1). Federal agencies should harmonize goals and metrics with other Federal strategic planning initiatives where appropriate.

## **PART EIGHT. NEXT STEPS: BUILDING A MORE RESILIENT NATION**

Over the past year, the Task Force has developed a vision, guiding principles, and policy goals that will provide a foundation for the Federal Government's role in a national adaptation strategy. The recommendations in this document are intended to foster action toward a common agenda of building a more resilient Nation. Achieving this goal requires the coordination and integration of both Federal and non-Federal efforts across multiple scales, sectors, and stakeholders.

To continue to make progress towards building national resilience to climate change, the Federal Government should begin to implement the recommendations in this report. Key next steps include:

- Implement adaptation planning within Federal agencies to consider and address climate change impacts on missions, operations, and programs.
- Strengthen interagency coordination to build a robust body of accessible science and tools to inform and support adaptation decisions.
- Enhance the Government's ability to support and implement adaptive actions for the cross-cutting issues discussed in this report, and address additional cross-cutting issues over the next year (including coastal and ocean resilience and fish, wildlife, and plants).
- Develop an international adaptation strategy that builds on and enhances ongoing efforts, supports the core principles and objectives of the President's new Global Development Policy, and coordinates resources and expertise across the Federal Government to support international adaptation initiatives.
- Improve coordination of Federal efforts at the regional level to create efficiencies in climate science and services and to meet local, state, and regional adaptation needs.
- Establish a partnership committee composed of local, state, and Tribal representatives to allow the Task Force to consult with critical partners as the Federal Government begins to implement the actions contained in this report.
- Develop methods for evaluating the effectiveness of Federal actions to increase national adaptive capacity and resilience, which will be critical for continuously refining and improving the Government's approach to adaptation.

The Task Force will continue to meet over the next year to maintain an interagency forum for discussing the Federal Government's adaptation approach and to monitor the implementation of recommended actions articulated in this report. The Task Force will prepare a progress report in October 2011 that

documents the results of Federal Government adaptation efforts over the year and provides additional recommendations for refining the Federal Government's adaptation efforts, as appropriate.

Through the actions described in this report and the collective actions of stakeholders at all levels, we strive to be a Nation that better understands, and is better prepared for, the impacts of a changing climate. Adaptation across all scales and sectors will enable us to reduce the risks and seize the opportunities presented by climate change. These efforts, in tandem with advancing efforts to manage greenhouse gas emissions, are initial steps in what must be a long-term, iterative, and collaborative approach to make our Nation more resilient to a range of possible futures.

## **APPENDIX A. MEMBERS OF THE INTERAGENCY CLIMATE CHANGE ADAPTATION TASK FORCE**

### **Co-Chairs**

Nancy H. Sutley, Chair, Council on Environmental Quality  
Jane Lubchenco, Administrator, National Oceanic and Atmospheric Administration  
Shere Abbott, Associate Director for Environment, Office of Science and Technology Policy

### **Steering Committee**

Ron Sims, Deputy Secretary, Department of Housing and Urban Development  
David J. Hayes, Deputy Secretary, Department of the Interior  
Jonathon Pershing, U.S. Deputy Special Envoy for Climate Change, Department of State  
Bob Perciasepe, Deputy Administrator, Environmental Protection Agency  
Craig Fugate, Administrator, Federal Emergency Management Agency  
Sally Ericsson, Associate Director for Natural Resources Programs, Office of Management and Budget

### **Executive Office of the President**

#### *Council on Environmental Quality (CEQ)*

Jason Bordoff, Associate Director for Energy and Climate Change  
Maria Blair, Deputy Associate Director for Climate Change Adaptation

#### *Office of Energy and Climate Change (OECC)*

Heather Zichal, Deputy Assistant to the President for Energy & Climate Change  
Joe Aldy, Special Assistant to the President (Energy and Environment)

#### *Office of Science & Technology Policy (OSTP)*

John Holdren, Director  
Phil DeCola, Senior Policy Analyst  
Diana DiEuliis, Assistant Director for Life Science  
Kathy Jacobs, Assistant Director for Climate Adaptation and Assessment

#### *National Security Staff (NSS)*

Ed Fendley, Director for International Environmental Issues

#### *Office of Management and Budget*

Cass Sunstein, Counselor, Office of Information and Regulatory Affairs

#### *Council of Economic Advisors*

Cecilia Rouse, Member  
Arik Levinson, Senior Economist

#### *National Economic Council*

Diana Farrell, Deputy Assistant to the President for Economic Policy

### **Departments**

#### *Agriculture (USDA)*

James W. Miller, Undersecretary for Farm and Foreign Agricultural Services  
William Hohenstein, Director of Global Change Program Office



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Robert Bonnie, Senior Advisor to the Secretary for Environment and Climate

*Commerce (DOC)*

Tom Karl, Director, National Climate Data Center

Monica Medina, Senior Advisor to the Administrator, NOAA

*Defense (DOD)*

Michele Flournoy, Undersecretary of Defense for Policy

Dorothy Robyn, Deputy Undersecretary for Defense Installations and Environment

Joellen Darcy, Assistant Secretary for Civil Works, Department of the Army

Jeff Marqusee, Executive Director, The Environmental Security Technology Certification Program

Maureen Sullivan, Director, Environmental Management, Office of Secretary of Defense

Bob Pietrowsky, Director of Institute for Water Resources, USACE

Terrence (“Rock”) Salt, Principal Deputy Assistant Secretary of the Army (Civil Works)

*Education (DOEd)*

Steven Robinson, Special Advisor to the Secretary

Glenn Cummings, Deputy Assistant Secretary, Vocational and Adult Education

*Energy (DOE)*

David Sandalow, Assistant Secretary for Policy & International Affairs

Rick Duke, Deputy Assistant Secretary for Climate Policy

Bob Marlay, Director Office of Climate Change Policy & Technology

Craig Zamuda, Senior Policy Advisor, Office of Climate Change Policy & Technology

*Health and Human Services (HHS)*

Howard Koh, Assistant Secretary for Health

John Balbus, Senior Advisor for Public Health, NIH

Howard Frumkin, Director, National Center for Environmental Health

*Homeland Security (DHS)*

Alice C. Hill, Senior Counselor to the Secretary

Dave Kaufman, Director of FEMA Office Policy and Program Analysis

*Housing and Urban Development (HUD)*

James Lopez, Senior Advisor to the Deputy Secretary

*Interior (DOI)*

Tom Armstrong, Senior Advisor on Climate Change to the Deputy Secretary of the Interior

*State (DOS)*

Trigg Talley, Director, Office of Global Change

*Transportation (DOT)*

Roy Kienitz, Undersecretary of Transportation for Policy

Kathryn Thomson, Counselor to the Secretary

Linda Lawson, Director, Office of Safety, Energy, and Environment

*Treasury*

Billy Pizer, Deputy Assistant Secretary for Environment and Energy

**Independent Agencies**

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*Agency for International Development (USAID)*

Bill Breed, USAID Global Climate Change Team Leader

*United States Environmental Protection Agency (EPA)*

Lisa Heinzerling, Associate Administrator for Policy

Robert Verchick, Deputy Associate Administrator for Policy

*National Aeronautics and Space Administration (NASA)*

Michael Freilich, Director of Earth Science Division

Jack Kaye, Associate Director for Research, Earth Science Division

*National Intelligence Council (NIC)*

Rich Engel, Director, Climate Change and State Stability Program

*Millennium Challenge Corporation (MCC)*

Darius Teter, Deputy Vice President, Compact Operations

James Greene, Deputy Vice President, Policy and International Relations

**Key Support Personnel**

*Council on Environmental Quality (CEQ)*

Loren Labovitch, Climate Adaptation Manager

Allison Castellan, Climate Adaptation Analyst

Kim Penn, Climate Adaptation Analyst

Bill Perkins, Climate Adaptation Analyst

Seth Silverman, Climate Adaptation Analyst

## **APPENDIX B. WORKGROUPS OF THE INTERAGENCY CLIMATE CHANGE ADAPTATION TASK FORCE**

### **Adaptation Science**

National Oceanic and Atmospheric Administration\*  
Office of Science and Technology Policy\*  
American Association for the Advancement of Science  
Bureau of Land Management  
Centers for Disease Control  
Council on Environmental Quality  
Department of Agriculture  
Department of Homeland Security  
Department of Energy  
Department of Defense  
Department of State  
Department of Transportation  
Environmental Protection Agency  
National Aeronautics and Space Administration  
National Institute of Food and Agriculture  
National Institutes of Health  
National Science Foundation  
USDA Forest Service  
U.S. Army Corps of Engineers  
U.S. Agency for International Development  
U.S. Fish and Wildlife Service  
U.S. Global Change Research Program  
U.S. Geological Survey

### **Agency Adaptation Planning**

Department of Housing and Urban Development\*  
Environmental Protection Agency\*  
Centers for Disease Control  
Council of Economic Advisers  
Council on Environmental Quality  
Department of Homeland Security  
Department of Defense  
Department of Energy  
Department of the Interior  
Department of Transportation  
Federal Emergency Management Agency  
National Park Service  
Office of the Chief Economist  
Office of Federal Environmental Executive

Office of Management and Budget  
U.S. Army Corps of Engineers  
U.S. Agency for International Development  
U.S. Department of Agriculture  
U.S. Global Change Research Program  
U.S. Geological Survey

### **Water Resources Adaptation**

Council on Environmental Quality\*  
U.S. Geological Survey\*  
Environmental Protection Agency\*  
Centers for Disease Control  
Department of Energy  
Department of State  
National Aeronautics and Space Administration  
National Oceanic and Atmospheric Administration  
National Park Service  
National Science Foundation  
Office of Science and Technology Policy  
USDA Forest Service  
U.S. Bureau of Reclamation  
U.S. Army Corps of Engineers  
U.S. Agency for International Development  
U.S. Department of Agriculture  
U.S. Global Change Research Program

### **Insurance Adaptation**

Office of Management and Budget\*  
U.S. Army Corps of Engineers\*  
Department of Transportation\*  
Council of Economic Advisers  
Council on Environmental Quality  
Department of Homeland Security  
Department of the Interior  
Department of the Treasury  
Federal Emergency Management Agency  
National Oceanic and Atmospheric Administration  
Office of the Chief Economist  
Office of Science and Technology Policy  
U.S. Agency for International Development  
U.S. Department of Agriculture  
U.S. Fish and Wildlife Service

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\* Designates workgroup co-chair.

**International Resilience**

Council on Environmental Quality\*  
U.S. Department of State\*  
U.S. Army Corps of Engineers\*  
Centers for Disease Control  
Department of Defense  
Department of Energy  
Department of Homeland Security  
Department of the Interior  
Department of Transportation  
Department of the Treasury  
Environmental Protection Agency  
Federal Emergency Management Agency  
Millennium Challenge Corporation  
National Aeronautics and Space  
Administration  
National Intelligence Council  
National Oceanic and Atmospheric  
Administration  
National Security Staff  
Office of Management and Budget  
Office of Science and Technology Policy  
U.S. Agency for International Development  
U.S. Department of Agriculture  
U.S. Fish and Wildlife Service  
U.S. Global Change Research Program  
U.S. Geological Survey

**Communications and Outreach**

Council on Environmental Quality\*  
Department of the Interior  
Environmental Protection Agency  
Federal Emergency Management Agency  
National Oceanic and Atmospheric  
Administration  
National Science Foundation  
U.S. Department of Agriculture  
U.S. Global Change Research Program  
U.S. Geological Survey

**Urban**

Environmental Protection Agency\*  
Department of Transportation\*  
Council on Environmental Quality  
Department of State  
Federal Emergency Management Agency  
Department of Housing and Urban Development  
National Oceanic and Atmospheric  
Administration  
U.S. Army Corps of Engineers

**Health**

Centers for Disease Control\*  
National Institutes of Health\*  
Council on Environmental Quality  
Department of Defense  
Department of Homeland Security  
Department of the Interior  
Environmental Protection Agency  
National Oceanic and Atmospheric  
Administration  
Office of Science and Technology Policy  
Smithsonian Institute  
U.S. Department of Agriculture  
U.S. Global Change Research Program  
U.S. Geological Survey

**Plants, Fish, Wildlife**

U.S. Fish and Wildlife Service\*  
Council on Environmental Quality  
National Oceanic and Atmospheric  
Administration  
Office of Management and Budget  
USDA Forest Service  
U.S. Army Corps of Engineers  
U.S. Department of Agriculture

## **APPENDIX C. SUMMARY OF PUBLIC OUTREACH EFFORTS OF THE INTERAGENCY CLIMATE CHANGE ADAPTATION TASK FORCE**

### ***Major public outreach meetings of the Task Force***<sup>26</sup>

- Health, Portland (sponsored by CDC) – June 6, 2010
- Hazard Preparedness, Miami (sponsored by FEMA, NOAA) – June 23, 2010
- Island Resilience, Honolulu (sponsored by DOI, NOAA) – July 9, 2010
- Urban and Ecosystems, Chicago (sponsored by EPA, HUD) – July 15, 2010
- Agriculture, Denver (sponsored by USDA) – July 19, 2010

### ***Workgroup-sponsored listening sessions (25 sessions)***

#### *Urban Workgroup*

- Urban Adaptation Issues #1 – May 5, 2010
- Urban Adaptation Issues #2 – May 12, 2010

#### *Science Workgroup*

- Adaptation Science and Cities – October 29, 2009
- Adaptation Science and States – November 5, 2009
- Adaptation Science and Planners, Resource Managers, and Decision makers – November 12, 2009
- Science regional case, Gulf Coast #1 – April 8, 2010  
(Incorporating Climate Change into Decision Making and Planning)
- Science regional case, Gulf Coast #2 – April 15, 2010  
(Climate Information Needs for the Transportation Sector (Phase II of DOT study))
- Science regional case, Gulf Coast #3 – April 23, 2010  
(Building Ecosystem Resilience to Climate Change)

#### *Water Adaptation Workgroup*

- Energy and Industrial Organizations – October 27, 2009
- State, Tribal and Water Utility Organizations – October 28, 2009
- Environmental and Coastal Organizations – October 28, 2009
- Agriculture and Transportation Organizations – November 2, 2009
- Public Health Organizations – December 1, 2009

#### *International Adaptation Workgroup*

- Development Assistance and Humanitarian Relief Organizations – November 6, 2009
- National Security Organizations – November 9, 2009
- Private sector businesses – November 12, 2009

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<sup>26</sup> See Appendix E for a more detailed summary of the five public outreach meetings.

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### *Agency Adaptation Workgroup*

- National Governments – October 26, 2009
- National Governments, II – October 27, 2009
- Local Governments – November 6, 2009
- State Governments – November 16, 2009
- Tribes – November 16, 2009

### *Insurance Adaptation Workgroup*

- Industry Perspectives – November 4, 2009
- Commissioner Perspectives – November 10, 2009
- Academic Perspectives – November 19, 2009

### *Health Workgroup*

- Health Adaptation – April 30, 2010

### ***Other outreach events, workshops, and meetings***

- Special Adaptation Session during the Native Peoples Native Homelands Tribal Climate Change Conference ([www.nativepeoplesnativehomelands.org](http://www.nativepeoplesnativehomelands.org)) – November 19, 2009, Minnesota
- Science Translation Workshop – April 30, 2010, Washington, D.C.
- National Adaptation Summit – May 19, 2010, Washington, D.C.
- Institute for Sustainable Communities/CCAP listening session with non-Federal partners – June 16, 2010
- Private Sector Focus Group on International Climate Adaptation and Resilience – June 21, 2010, Washington D.C.

## APPENDIX D. SUMMARY OF PUBLIC COMMENTS RECEIVED ON THE INTERAGENCY CLIMATE CHANGE ADAPTATION TASK FORCE INTERIM PROGRESS REPORT

The Task Force received over 27,000 public comments regarding its March 16, 2010 Interim Progress Report<sup>27</sup>. Comments were submitted to CEQ's public website. Comments were received from a variety of stakeholders including environmental advocacy groups, private industry, government representatives, and the general public. Of the total comments received, approximately 25,000 were "mass mailers" (form letters) from members of non-profit organizations. The great majority of the comments were positive and supported the Task Force's efforts on adaptation, though there were some comments that expressed skepticism about climate change and the need to adapt. Some common themes among the comments received are summarized below (in no particular order):

- **Broad stakeholder engagement is necessary** – many groups were concerned that there was not enough stakeholder engagement thus far, and they wanted to see a process moving forward that would incorporate stakeholder feedback, especially that of vulnerable populations. Additionally, many of the groups are interested in further engagement with the Task Force.
- **Coordination and collaboration is necessary between all levels of government and stakeholders** – many groups commented that the current coordination and collaboration efforts are lacking, and they wanted to see a process moving forward that would provide a coordination mechanism.
- **Funding at the local/State level is needed** – many groups commented that adaptation actions will largely be taken at the local level and that sustained funding would be necessary to support those actions.
- **Supportive of Federal guidance and leadership** – while most adaptation actions occur at the local level, many people suggested that more Federal guidance and leadership is needed.
- **Improve accessibility of science through creating an information clearinghouse for decision makers at many scales** – in order for policy makers at all levels of government to make sustainable long-term decisions, groups asked for a single place to gather information, and provide that information in way that is usable.

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<sup>27</sup> All public comments received on the interim progress report can be viewed at <http://www.whitehouse.gov/administration/eop/ceq/initiatives/adaptation/comments>.



- **Include end-users of scientific information in the decision making process** – these users must be engaged in the shaping of Federal research programs.
- **A national strategy should be flexible and scalable** – the national strategy should be responsive to the needs and priorities of stakeholders and be able to be adjusted as those needs change.
- **Prioritization and evaluation methods are essential** – many groups expressed that prioritization was needed from the Federal level, especially for help with local actions and funding. Additionally, many groups were interested in an evaluation component that could gauge the effectiveness of adaptation actions.
- **Ecosystem-based approaches should be pursued for adaptation** – many of the groups stressed that ecosystem-based approaches to adaptation were no-regret solutions that would help build sustainability and resiliency.
- **Support for review of existing regulations and policies** – many groups expressed the need for decision makers to review existing policies and regulations to ensure that they did not inadvertently increase vulnerability to climate change.

## APPENDIX E. SUMMARIES OF THE TASK FORCE'S PUBLIC OUTREACH MEETINGS

### *Summary of CDC Public Outreach Meeting (June 6, 2010 in Portland, OR<sup>28</sup>)*

**Background:** This outreach meeting was organized by CDC on behalf of the Task Force. It was held in conjunction with the annual meeting of the Council of State and Territorial Epidemiologists as an evening keynote session. Objectives for the meeting included:

- To discuss the likely range of climate change impacts to public health and the need for adaptation strategies to reduce vulnerability and increase resilience;
- To inform stakeholders at all levels about the work of the Task Force, as well as public health adaptation efforts underway at the Federal level; and
- To provide an opportunity for the Task Force to listen to state and local public health officials describe efforts already underway to plan for climate change, as well as their needs and challenges.

**Participation and Agenda:** Speakers included Task Force members as well as State and local health officials. The session focused around an expert panel on public health adaptation. In addition, diverse stakeholders (e.g., local and State governments, non-governmental organizations, and private citizens) provided input during the public comment period.

**Outcome and Findings:** The outreach meeting provided an excellent opportunity for information sharing between the Federal Government and its local and regional partners on adaptation. The following key messages, themes, and recommendations relevant to adaptation emerged during the panel discussions and public comment period:

- Enhanced surveillance is needed on the public health impacts of climate change, including measurement of additional indicators.
- The Federal Government should ensure that there is a collaborative and cohesive Federal response to climate change.
- Adaptation efforts must address vulnerable populations and incorporate efforts to reduce existing health inequities that will be exacerbated by climate change.
- There can be significant public health benefits from mitigation actions, and these should be better communicated to the public.

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<sup>28</sup> See <http://www.whitehouse.gov/administration/eop/ceq/initiatives/adaptation/publicmeetings> for a complete agenda and archived webcast of all public outreach meetings.

- Public health stakeholders need to be brought together to plan for climate change.
- Better urban planning and design can increase community resilience.
- There is a need for stronger communication in general on climate change health impacts, e.g., heat waves.

*Summary of NOAA/FEMA Public Outreach Meeting (June 23, 2010 in Miami, FL)*

**Background:** This listening session was organized by NOAA and FEMA on behalf of the Task Force.

Objectives for the session included:

- To discuss the likely range of coastal climate change impacts and the growing need for adaptation strategies to ensure community resilience;
- To inform stakeholders at all levels about how communities are preparing for and responding to climate change impacts; and
- To provide an opportunity for the Task Force to listen to local and regional decision makers, managers, and planners describe efforts already underway to plan for climate change, as well as their needs and challenges.

**Participation and Agenda:** Speakers included Obama Administration officials, Task Force members, and local and regional scientists, elected officials, agency personnel, and ecosystem managers. The session included two panels:

- Hazard preparedness and climate change adaptation; and
- Water resource management and downstream implications for the Everglades.

In addition, diverse stakeholders (e.g, non-governmental organizations, local governments, private citizens) provided input during public comment periods. A press conference followed.

**Outcome and Findings:** The listening session provided an excellent opportunity for information sharing between the Federal Government and its local and regional partners on adaptation. The following key messages, themes, and recommendations relevant to adaptation emerged:

- Climate change needs to be integrated into existing and emerging plans and operations.
- Support and expand partnerships between the Federal government and its local partners on climate change adaptation; build on existing successful local-Federal partnerships (e.g., NOAA's Digital Coasts tool for planning efforts in South Florida).
- Public education and risk communication are important for building understanding.

- Disaster planning is a form of climate change adaptation, and communities already plan for disasters; we can learn from these efforts as we build a “risk-smart future.”
- Community resilience depends on ecosystem resilience. South Florida is an excellent case study for emphasizing the importance of ecosystem-based adaptation; restoring the Everglades ecosystem will buffer the urban communities from climate change impacts.
- The Federal Government can facilitate adaptation by providing technical assistance, tools, information, and financial resources to its partners.
- Accessible science and tools are needed to support adaptation decisions. Scientific priorities discussed include:
  - Conduct risk and vulnerability assessments at local-to-regional scales
  - Improve climate change projections at the regional scale
  - Reduce uncertainty of sea level rise projections
  - Develop communication and decision-support tools (e.g., visualization, valuation)
- An effective mantra for adaptation is: “Think globally, work regionally, act locally.”

*Summary of NOAA/DOI Public Outreach Meeting (July 9, 2010 in Honolulu, HI)*

**Background:** This public outreach meeting was organized by NOAA and DOI on behalf of the Task Force. Objectives for the session included:

- To discuss the likely range of coastal climate change impacts and the growing need for adaptation strategies to ensure island community resilience;
- To inform stakeholders at all levels about how communities are preparing for and responding to climate change impacts; and
- To provide an opportunity for the Task Force to listen to local and regional decision makers, managers, and planners describe efforts already underway to plan for climate change, as well as their needs and challenges.

**Participation and Agenda:** Speakers included Obama Administration officials, Task Force members, and local and regional scientists, elected officials, agency personnel, and ecosystem managers. The session focused on an expert panel that discussed different facets of island resiliency in the face of climate change. In addition, diverse stakeholders (e.g., non-governmental organizations, local governments, private citizens) provided input during public comment periods.

**Outcome and Findings:** The listening session provided an excellent opportunity for information sharing between the Federal Government and its local and regional partners on adaptation. The following key messages, themes, and recommendations relevant to adaptation emerged:

- Climate mitigation and adaptation in the islands is not a long-term strategy, they must happen now and they should both be pursued.
- Adaptation (and mitigation) investments should include enhanced education and literacy programs and targeted opportunities to engage and empower youth.
- Support and expand partnerships between the Federal Government and its local partners on climate change adaptation; build on existing successful local-Federal partnerships.
- Migration from islands should be considered with climate adaptation, and there is a potential need for a national migration strategy.
- Community resilience depends on ecosystem resilience. There is a need for research and stable funding for natural resource adaptation.
- The Federal Government can facilitate adaptation by providing technical assistance, tools, information, and financial resources to its partners including alternative energy development.
- In climate adaptation planning there should be a cultural component to decision making.
- In the Pacific Islands, climate change impacts will drive competition for both land and water, and adaptation plans incorporating them should be a priority.

***Summary of EPA/HUD Public Outreach Meeting (July 15, 2010 in Chicago, IL)***

**Background:** This public outreach meeting was organized by EPA and HUD on behalf of the Task Force. Objectives for this session included:

- To discuss the likely range of climate change impacts on the Great Lakes region and the growing need for adaptation strategies to ensure healthy economies and ecosystems;
- To inform stakeholders and public about the Task Force as well as adaptation efforts underway at the Federal level; and
- To provide an opportunity for the Task Force to listen to local and regional experts describe adaptation efforts underway in the Great Lakes region and their needs and challenges.

**Participation and Agenda:** Speakers included Task Force members, local and regional scientists, Federal and local decision makers, and non-governmental representatives. The session included two panels: (1) Great Lakes Ecosystem Adaptation; and (2) Urban Infrastructure Adaptation. In addition, diverse stakeholders (i.e., local and State governments, non-governmental organizations, and private citizens) provided input during public comment periods.

**Outcome and Findings:** The session provided an excellent opportunity for information sharing between the Federal Government and regional partners on adaptation. The following key themes and recommendations emerged during the panel and public comment sessions:

- An ecosystem-based approach to adaptation is critical. The Great Lakes Restoration Initiative is a good model for how Federal agencies can work across sectors.
- Adaptation actions need to have a strong monitoring component. Federal guidance on monitoring is important in order to compare different adaptation approaches.
- The Federal Government needs to facilitate local adaptation through encouragement, regulation, and financial and technical assistance. Priorities discussed included:
  - Region-specific, downscaled climate projections, especially of storm intensity
  - Tools and support for conducting vulnerability and risk assessments
  - Science translators based in communities (e.g., extension model)
  - Analyses of the economic benefits of adaptation (or costs of inaction)
  - Opportunities for sharing lessons learned
- We don't always need new resources; we just need to realign existing resources more effectively. Adaptation needs to be integrated into existing activities, and adaptation actions that also have mitigation benefits need to be prioritized.
- The Federal Government has a key role in adaptation messaging to ensure a consistent message across the Government. The public needs to understand climate science is sound.
- Water resources and urban areas are two of the most critical focus points for adaptation. Most of the population lives in urban areas and water drives many other issues (e.g., health, agriculture, energy, etc.).

***Summary of USDA Public Outreach Meeting (July 19, 2010 in Denver, CO)***

**Background:** This public outreach meeting was organized by USDA on behalf of the Task Force. The Task Force meeting was held as part of an all-day event hosted by USDA on Helping Agriculture Adapt to a Changing Climate. The morning session of the USDA event focused on the latest science related to climate change and agriculture and provided case studies of how farmers are being affected by climate change. Objectives for this session included:

- To discuss the likely range of climate change impacts on the agriculture sector and the growing need for adaptation strategies to ensure food security, robust rural economies, and healthy ecosystems.
- To inform stakeholders and public about the Task Force as well as adaptation efforts underway at the Federal level; and

- To provide an opportunity for the Task Force to listen to farmers and stakeholders as well as local and regional experts describe the need for adaptation efforts especially in the agriculture sector.

**Participation and Agenda:** Speakers included Task Force members, farmers and representatives of farm organizations, and scientists. The session included two panels: (1) Administration Strategy; and (2) Reactions from Agriculture. In addition, diverse stakeholders (i.e., Tribal governments, non-governmental organizations, and private citizens) provided input during public comment period.

**Outcome and Findings:** The meeting offered insight into the risks and vulnerabilities of the agriculture sector to climate change and priorities for Federal responses. The following key themes and recommendations emerged during the panel and public comment sessions:

- Farmers and ranchers have experience in understanding and managing risks. However, climate change may pose new risks that will require new management strategies.
- Farmers have many questions about the rate and nature of climate change, expected impacts and risks, and adaptation strategies.
- The risks to agriculture are widespread and include: changes to winter snowpack, extreme temperatures during grain set and pollination, fewer cooling degree days for setting deciduous tree fruits, changes to pest and disease outbreaks, and increases in extreme weather events. These impacts vary by region.
- Farmers rely on a number of Federal programs for information and assistance in managing their lands. These programs could be leveraged to educate and inform farmers and ranchers about climate change and to help them manage risks. Examples include: crop insurance, extension, and conservation programs.
- Although climate change is a long-term phenomenon, actions must begin soon to help agriculture adapt. These adaptation measures will have costs.
- Development of new plants and production practices may take years to perfect, and there are numerous crops (in particular specialty crops) that might be affected.
- The Federal Government will need to continue to focus on research to help farmers adapt to climate change, including developing new drought- and salinity-tolerant varieties, pest and disease eradication tools, systems to improve irrigation efficiency, and improved water storage capacity for agricultural uses.
- To be fully successful, farmers will need technical assistance from the Federal Government and practical guidance on adaptation strategies.



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- Natural resource inventories and data systems should be used to monitor and track the impacts of climate change on land systems.

## APPENDIX F. NATIONAL CLIMATE ADAPTATION SUMMIT REPORT EXECUTIVE SUMMARY

The National Climate Adaptation Summit was in response to a conversation the President's Science and Technology Advisor, Dr. John Holdren, had with the University Corporation for Atmospheric Research (UCAR) Board members and took place in Washington, DC, on May 25-27, 2010. This event brought together more than 180 users and providers of climate adaptation information to examine the needs, knowledge, and roles required for effective adaptation to climate change. The goal of the Summit was to inform Federal, state, regional, and local climate adaptation efforts, including the planning of the Federal Interagency Climate Change Adaptation Task Force and the U.S. Global Change Research Program.

**There was a strong consensus among participants that wise adaptation measures can help minimize the negative impacts of a changing climate on our Nation's communities, businesses, ecosystems, and citizens.** Effective adaptation will require improved coordination within agencies and among agencies, states, regions and the private sector. It also calls for new methods of communication; sharing of best practices; budget increases in a few key areas; research to produce needed missing information; development of new partnerships; and 'learning by doing', or *adaptive* adaptation.

### **The Summit identified seven priorities for near-term action:**

- **Developing an overarching national strategy to guide federal climate change adaptation programs.** This strategy should establish agency roles, clear goals and metrics, and better mechanisms for coordinating federal and non-federal activities.
- **Improving coordination of Federal plans and programs.** Strong management from the executive branch is needed to break down barriers, integrate planning, move funding into the highest priority areas, and maintain priorities across the multitude of involved agencies.
- **Creating a Federal climate information portal.** This would provide single-point access to data from all relevant Federal agencies and programs and would evolve over time into a more "national" portal with information about relevant non-Federal efforts.
- **Creating a clearinghouse of best practices and toolkits for adaptation.** Such an effort could assist regions and sectors with similar adaptation challenges in learning from each other and explore the intersection of adaptation and mitigation.
- **Including support for assessment in USGCRP agency budgets.** This would enable the regular national-scale assessments of climate change impacts that are required by law.
- **Increasing funding for research on vulnerability and impacts, including economic analyses, and pilot projects that join local, state, and regional governments and academic institutions to develop and test adaptation measures and tools.**
- **Initiating a regional series of ongoing climate adaptation forums.** The goal would be to integrate planning, communication, and coordination of activities across various agencies and U.S. regions.

## **APPENDIX G. ONGOING PILOT PROJECTS USING THE FLEXIBLE FRAMEWORK FOR ADAPTATION PLANNING**

### ***U.S. Army Corps of Engineers Pilots (Project-Level)***

Project-level pilots under the USACE Responses to Climate Change Program are actively using the flexible framework approach to climate change adaptation and resilience developed by the Task Force. Pilot projects include evaluations of multipurpose reservoir operations related to flood risk reduction, an ecosystem restoration project (complete), two planning studies affected by sea level change, an interagency (USACE-Reclamation) paired basin study evaluating the effects of climate change on sedimentation, and an interagency project addressing drought for a multipurpose reservoir impacting interstate water supply, among other purposes. Additional pilots will be conducted over the next year. To date, these pilots demonstrate that the flexible framework works well as an organizing tool and can be applied with good effect to existing USACE projects.

### ***Department of Homeland Security Pilot (Agency-Wide)***

DHS used the flexible framework to engage in an extended agency-wide adaptation planning exercise across all components. DHS determined it needed to take a proactive approach to climate adaptation in order to deliver on its missions set forth in the 2010 Quadrennial Homeland Security Review. As a collaborative, department-wide initiative, the project aimed to: raise awareness of impacts of climate change and risks to DHS mission and operations; identify and prioritize major impacts of climate change and risks to DHS; identify potential adaptation strategies; make recommendations for incorporating climate change adaptation into ongoing Departmental planning processes; and develop partnerships with other agencies, businesses and research institutions to leverage scientific/technical expertise and support future work. The pilot produced a report that will be provided to the DHS Secretary that includes a summary of Task Force activities and analysis of key risks identified in case study regions as well as potential recommendations for how DHS should address climate change moving forward.

### ***Department of Transportation Pilot (Agency Component, State-wide)***

Recognizing that FHWA must include climate change in its risk and vulnerability assessments of transportation infrastructure, DOT/FHWA set out to help transportation decision makers, particularly transportation planners, asset managers, and system operators, identify which infrastructure assets (a) are most exposed to the threats from climate change and/or (b) could result in the most serious consequences as a result of those threats. DOT/FHWA has developed a vulnerability tool for state and municipal planners that takes a deeper look at steps in the flexible framework for understanding climate risk and

applying that risk to mission and activities. DOT/FHWA is piloting this conceptual model among three to four State Departments of Transportation or Metropolitan Planning Organizations.

***EPA Pilot (Community-level)***

EPA is working in Iowa to identify barriers to and incentives for considering regional effects of climate change in hazard mitigation and other community planning processes. Several organizations are working to support resilient, sustainable communities in Iowa which are experiencing floods that are growing more severe and frequent. Communities in Iowa engage in multiple planning activities, including hazard mitigation planning and comprehensive or community planning, that can help guide them as they try to become more resilient to the effects of climate change. Iowa's recently passed smart planning legislation and its component smart planning principles can also help communities put plans in place that include adaptation strategies. Climate change information will be important to both risk assessment and community recovery decisions. This pilot will explore if and how climate change information should be considered in risk assessment and the implications this information may have for community planning options. This pilot has sought approaches with mutual benefits and synergies across planning requirements and has emphasized the need to work across agencies and levels of government to optimize results.