

**America's**  
**CLIMATE CHOICES**  
AT THE NATIONAL ACADEMIES



## **Adapting to the Impacts of Climate Change**

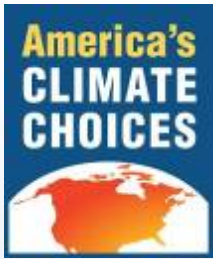
**Joel B. Smith, Member**  
**Panel on Adapting to the Impacts**  
**of Climate Change**

**Prepared for the Annual Hazards Research and Applications Workshop**

**July 11, 2010**

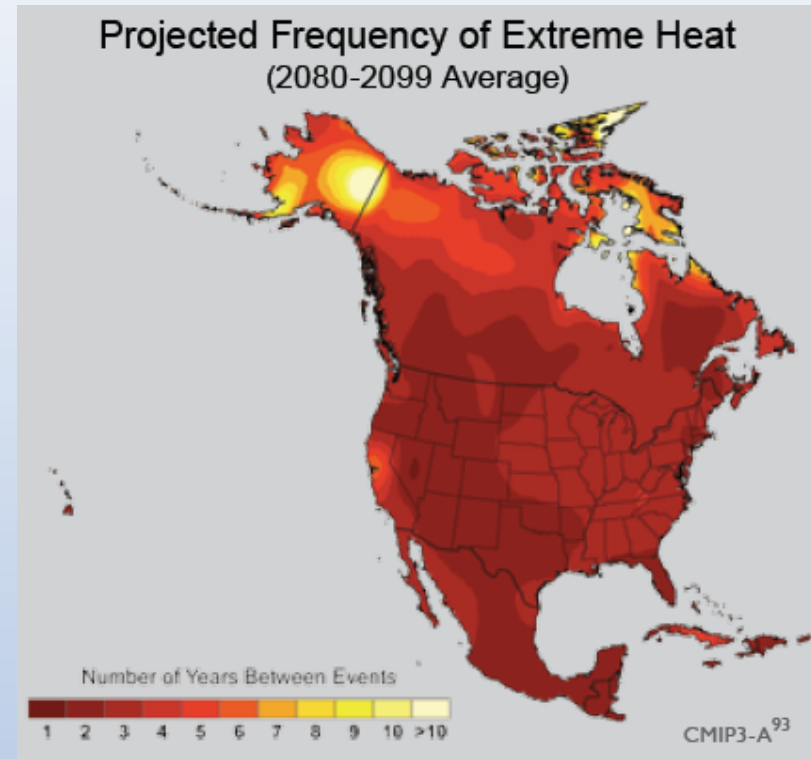
*<http://americasclimatechoices.org>*

**THE NATIONAL ACADEMIES**  
*Advisers to the Nation on Science, Engineering, and Medicine*



# The Charge to the Adapting Panel

- Given that the climate is changing and that changes will continue,
- Which means that climate change impacts are unavoidable – and very likely to grow:
- How can we adapt so that disruptions and pain to human and natural systems that we value are minimized,
- Both in the near term and the longer term?



SOURCE: USGCRP 2009



# Report Identifies Adaptations by Sector

Climate change	Impact	Possible adaptation action	Federal	State	Local govt.	Private sector	NGO / Indiv.
Higher temperature and reduced precipitation	Insufficient water supplies	Enhance supplies through traditional supply approaches including dams, larger reservoirs and other storage facilities, importing water or transferring water between basins (IPCC4; IPCC3; CALI; NRC). Other approaches include increasing system redundancy to ensure backup supplies, sharing integrated facilities between jurisdictions and sectors, obtaining a portfolio of multiple sources of water, including reuse of municipal wastewater (IPCC4; IPCC3; USGS; NRC; CCAWS)	■	■	■		
		Purchase alternative supplies through water trading and exchange (USGS; IPCC4). Store water during wet years or seasons (conjunctive management).		■	■	■	
		Participate in water supply protection through watershed management, including protecting surface water sources and groundwater recharge zones	■	■	■	■	■
		Encourage water harvesting and gray water use (NRC; IPCC4; CALI; IPCC3). Design sites to minimize water requirements (e.g. low water use landscaping) and retain gray water and storm water on site for landscape purposes (NRC; CALI; IPCC4)	■	■	■	■	■
		Regulate water use more stringently, restrict specific uses of water, adopt best practices for conservation and demand management in all sectors (CALI; CUWCC; IPCC3; IPCC4; NRC; USGS; CCAWS)	■	■	■	■	■
		Consider reform of water allocation by: allocating a percentage of available supplies rather than a fixed volume, establishing a water rights entitlement for the environment, downsizing or abandoning parts of a system, updating monitoring and accounting of water rights systems, enacting market reforms to allow interstate trading, and compensating rights holders and assisting in transition (FPB)	■	■	■	■	■
		Design pricing policies to encourage water conservation and to respond to drought or long-term storage conditions (CCAWS)	■	■	■	■	
	Inadequate water for ecosystems	Use water banking and other market mechanisms to augment supplies, regulatory or incentive programs to protect or enhance instream flows to support habitat, environmental mitigation programs to offset damage caused by new projects, contracts to access water during dry years, etc. to ensure supply (USGS; IPCC4)	■	■	■	■	■
		Revise/update environmental regulations to facilitate resolution of competing demands for water in light of changing conditions, e.g. adaptive management	■	■	■		
		Purchase water rights for environmental protection (5-1)		■	■	■	■
Decreased snow pack in West and Northeast	Enhance reservoir storage and aquifer storage capacity, reoperation of reservoirs, water transfers, vegetation management to enhance water storage and manage timing of runoff from watersheds	■	■	■			



## **But These Ideas Do Not Tell Us What Adaptation Actions To Take:**

- **Limited evidence so far of effectiveness in reducing climate *change* impacts**
- **Very limited knowledge of option costs, benefits, potentials, and limits**
- **Most importantly, what makes sense is very context-specific**



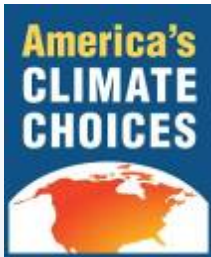
# What Can We Do?

- **Adopt a risk management approach as a strategy for preparing ourselves for an uncertain future**
  - **Consider a range of possible future climate conditions in adaptation planning**
    - **Internal discussion on pros and cons of using ranges vs. setting standards**
    - **Scientific soundness vs. ease of implementation**

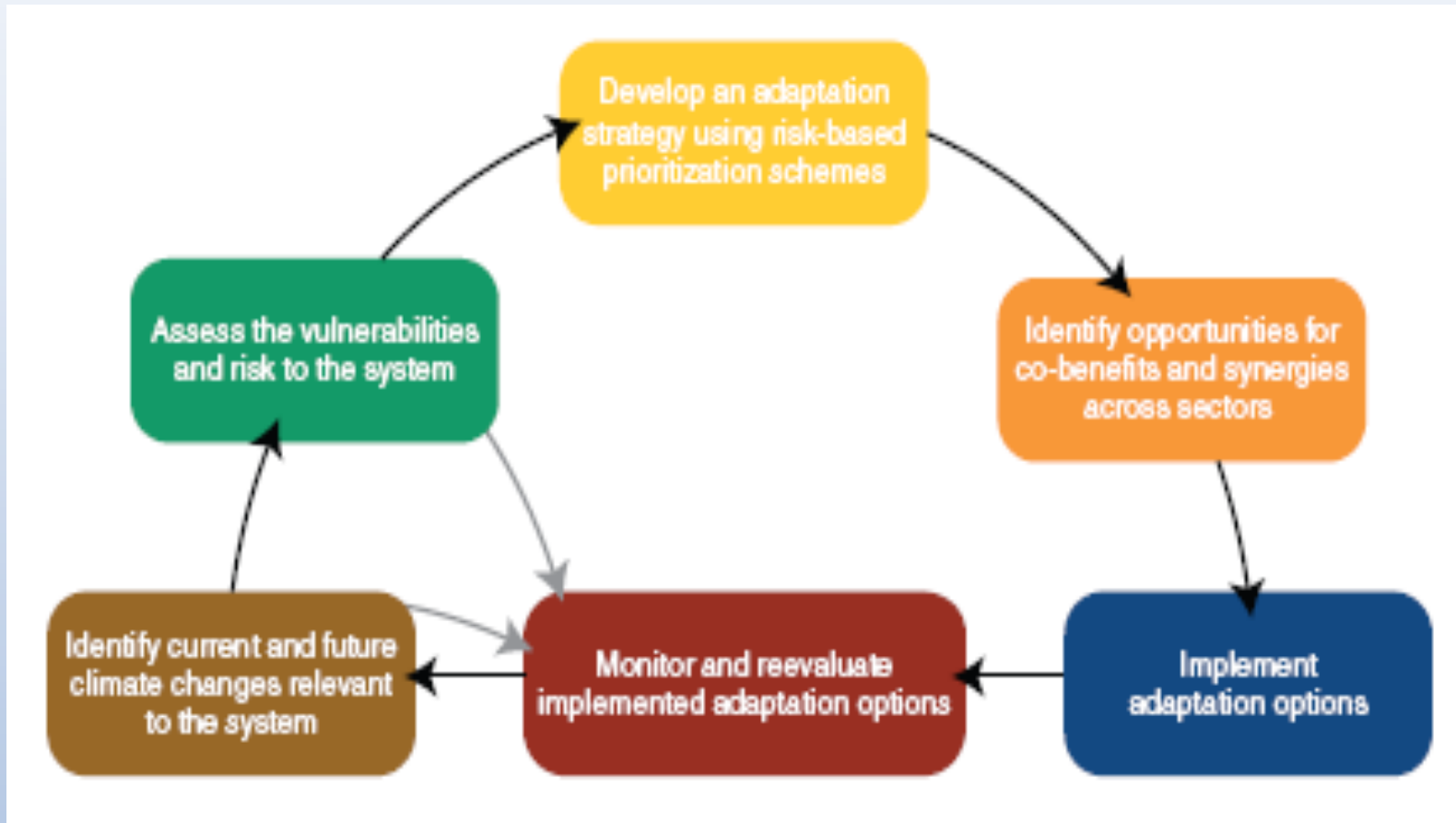


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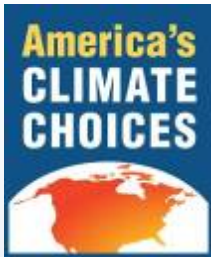
- **Adopt a risk management approach as a strategy for preparing ourselves for an uncertain future:**
  - **Identify adaptation options to reduce vulnerabilities**
  - **Implement adaptations that make sense now**
  - **Examine adaptations justified by climate change**
  - **Become more adaptive in planning for the future**



# Assessing Adaptation Options







## Adapting in the Short-Term Is Likely to Emphasize Options that Are:

- **Simple to do**
- **Focused on risks that we care about**
- **That offer co-benefits for other objectives**
- **That have broad constituency support**
- **(Consider maladaptive policies and practices)**



Source: <http://www.rittenhouseastronomicalsociety.org/Pictures/Fels/Philadelphia1.jpg>





## **Adapting In The Longer-term Is Likely To Consider Bigger Challenges:**

**Some climate changes might require transformational adaptations such as:**

- **Movements of people and facilities away from vulnerable areas**
- **Changes in ecosystem and land management**

**Managing risks for the long term calls for contingency planning for relatively severe impacts, combined with monitoring and research strategies**



## Moving Toward A **National** Strategy:

**Effective adaptation will combine a strong federal government adaptation commitment with grassroots-based, bottom-up efforts to capture the ingenuity and uniqueness of local adaptations while coordinating and communicating these efforts at a national level.**

- **Engage decision-makers and stakeholders across the branches and scales of government, sectors, and other parts of U.S. society**
- **In a true nation-wide partnership between federal government, states, tribes, municipalities, and private sector**
- **Other levels should not wait for the feds**
- **To set the framework and direction for a national adaptation program, drawing on what each party does best**



# Moving Toward A **National** Strategy:

## **Roles of the federal government:**

- **Fed gov't is catalyst and coordinator for national action**
- **Facilitate cooperation and collaboration across different levels of government and between government and other parties**
- **Provide technical and scientific resources to the range of parties carrying out vulnerability assessments and adaptation planning**
- **Support scientific research in climate change adaptation to strengthen risk management: better options, better information about options, better tools for informing decisions**
- **Practice adaptation in its own programs**



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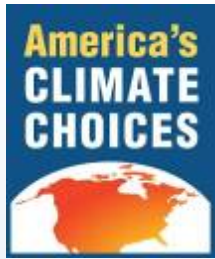
**A national adaptation program will itself need to be adaptive:**

- **Responding to changing conditions**
- **Informed by ongoing information collection and dissemination about climate change impacts and adaptation experiences**
- **Reviewing on a regular basis the effectiveness of current risk management strategies**



# Importance of international adaptation

- **US needs to play a more engaged and leading role on global adaptation, particularly in developing countries**
  - **Global equity and humanitarian concerns**
  - **Issues of national security**
  - **Need international coordination on adaptation**
  - **Exchange of knowledge: we can learn from others and they can learn from us**
  - **Opportunities to market American technology and know-how**



# Implications for Hazards Management

- **Address maladaptations**
  - **Change policies and practices that encourage risky behavior**
  - **Easier said than done**
- **Risk Management**
  - **Address range of risks**
  - **Recognize changing risks over time**
  - **Incorporate into risk management decisions**
    - **Standards**
    - **Designations of flood plains**
- **Address transformational adaptations**



# For More Information:

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Report is available online at:

<http://www.nap.edu>