Leveraging Impact & Adaptation Research for Policy Analysis and Program Development

Region 1 Climate Change Forum
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Presentation Outline

- **The State of Play**
- **Leveraging Science and Technology for:**
  - **Mitigation Policy Analysis and Integrated Assessment**
  - **Adaptation Policy analysis**
  - **Program Development (partnerships) and Outreach**

Areas of Current Policy/Program Activity

- EPA's Voluntary Programs have taken off and demonstrate opportunities for GHG mitigation across numerous sectors (see graphics on next page for examples)
- Energy and Climate Initiative has spurred partnerships with energy efficiency programs and developed opportunities in EPA regions
- Regulatory Activity
  - Mandatory GHG Reporting Rule
  - EISA expanded EPA's renewable fuels mandate
  - Advanced Notice of Proposed Rulemaking (CAA)
  - Geologic Sequestration of CO2 (SDWA)
- Legislative Activity
  - EPA analyzing numerous Bills in response to Hill requests

Select EPA Partnerships

climate change division

ENERGY STAR

CLIMATE LEADERS
U.S. Environmental Protection Agency

Clean EnergyEnvironment
STATE PARTNERSHIP

EPA GREEN POWER PARTNERSHIP

LANDFILL METHANE OUTREACH PROGRAM

PFC EMISSION REDUCTION PARTNERSHIP FOR THE SEMICONDUCTOR INDUSTRY

NaturalGas
EPA POLLUTION PREVENTER

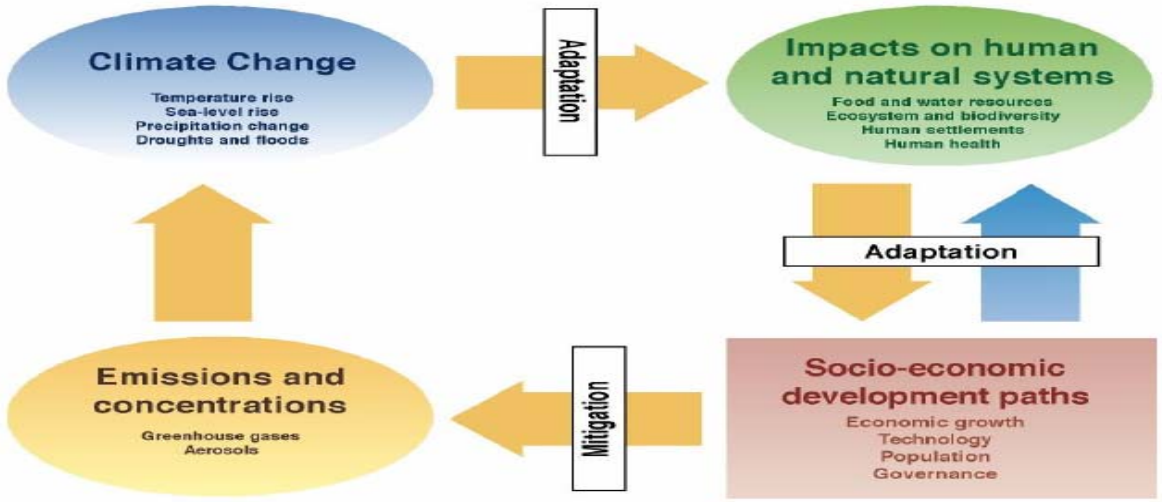
Methane to Markets

EPA USDA DOE
Ag STAR
ENERGY AND POLLUTION PREVENTION

SmartWay
Transport Partnership
U.S. ENVIRONMENTAL PROTECTION AGENCY

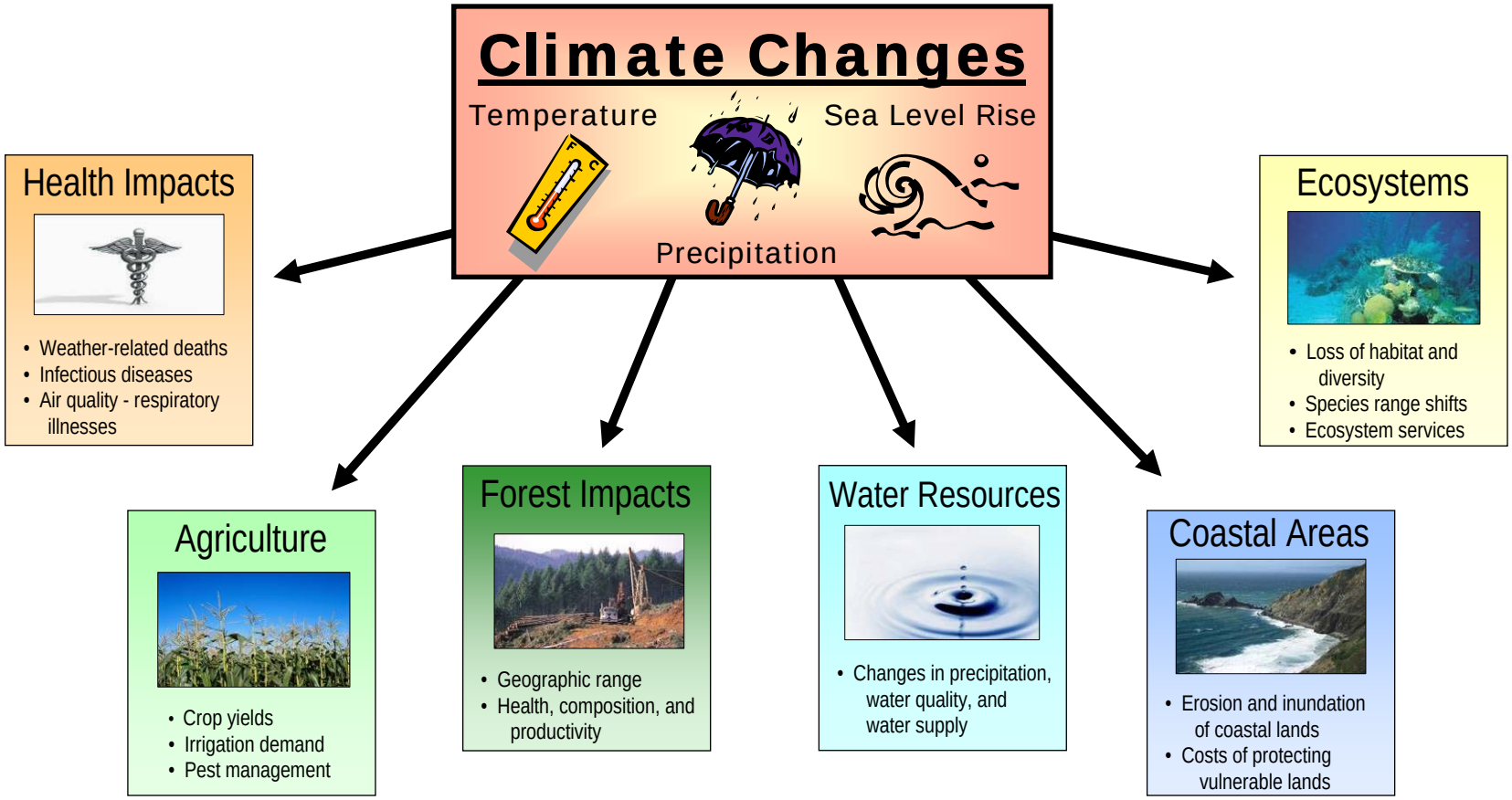
Impacts and Adaptation
Key Questions Driving Policy Analysis

- **What are the likely market & non-market impacts in the US?**
- **What are the benefits (avoided impacts, less risk) of mitigation?**
- **What is the recommended portfolio of adaptation & mitigation over time?**
- **What are appropriate adaptation measures given degree of committed climate change?**
- **What are the most appropriate roles (states, localities, geographic regions, federal) in evaluating assessment approaches and developing/implementing adaptation strategies?**



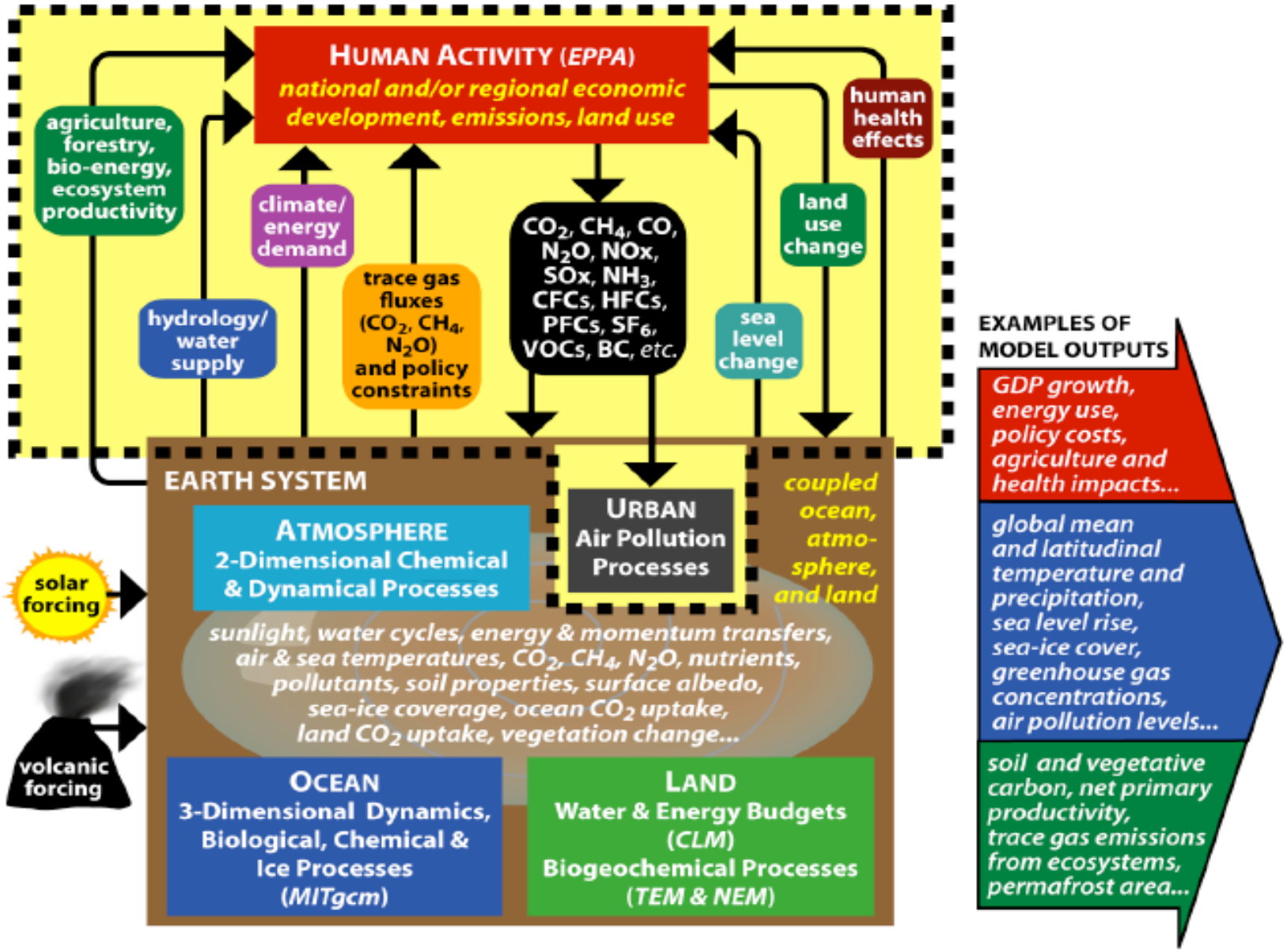
Leveraging Impact Assessments Across Sectors

"Impacts of climate change will vary regionally but, aggregated and discounted to the present, they are very likely to impose net annual costs which will increase over time." (IPCC, WGII, 2007)



Integrated assessment (IA) modeling supports policy analysis.

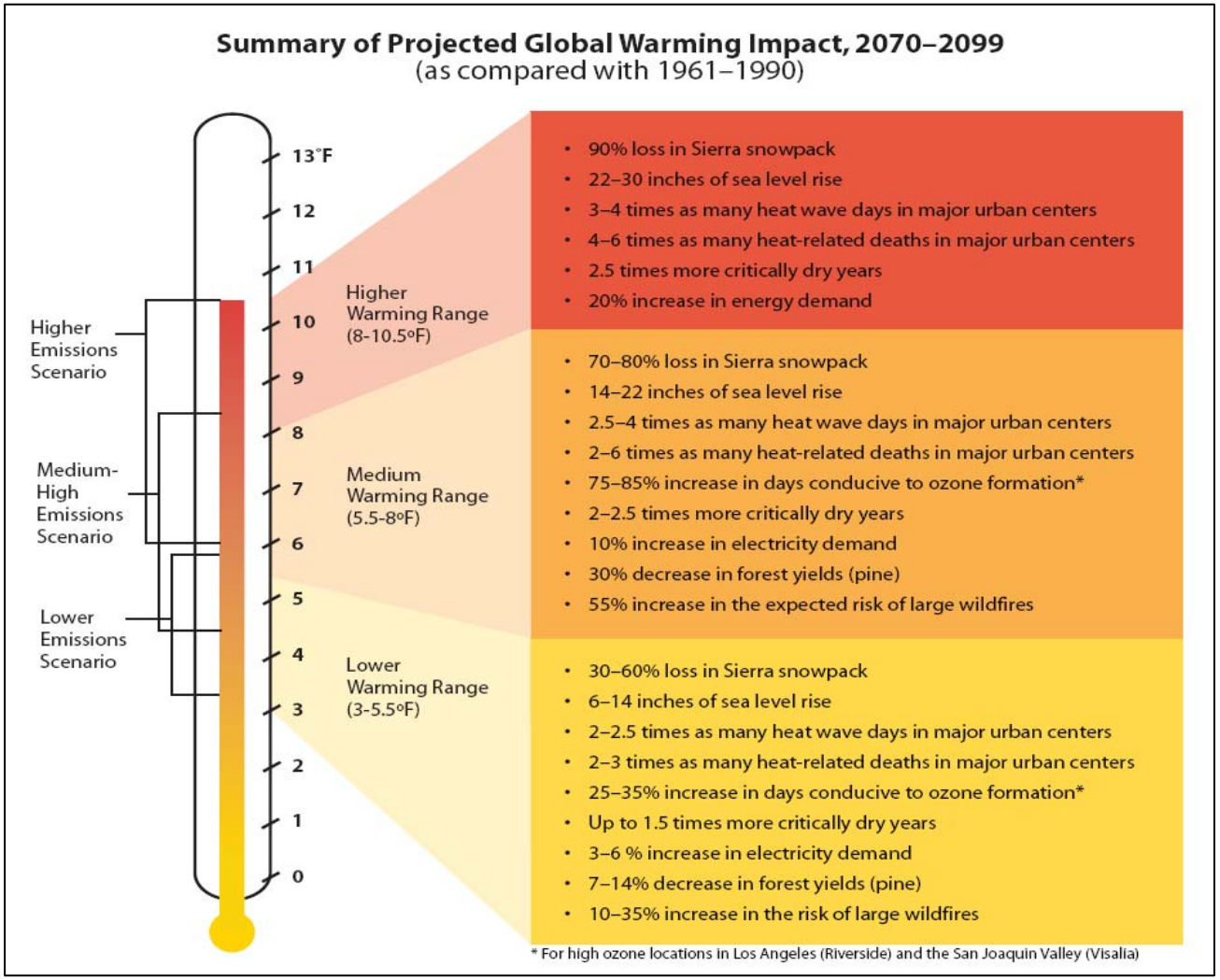
MIT IGSM Model Framework



Telling the Impacts Story vs. Analyzing Impacts Across All Sectors

California Impacts Assessment

Some impacts that are important to public may not be readily quantifiable or amenable to incorporation into economic models (e.g. ecosystem services).



California Climate Change Center (2006), *Our Changing Climate - Assessing the Risks to California*.

What Does Climate Science Tell Us About Needed Emission Reductions?

- UNFCCC, Art. 2: "…ultimate objective…stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference…"

- IPCC Fourth Assessment Report:
  - Determining what constitutes "dangerous anthropogenic interference"…involves value judgments
  - Science may help inform judgments as to which vulnerabilities may be considered key. IPCC lists five "reasons for concern":
    - Risks to unique and threatened systems
    - Risks of extreme weather events
    - Distribution of impacts (i.e., vulnerable regions & subpopulations)
    - Aggregate impacts (i.e., net costs projected to increase over time)
    - Risks of large-scale singularities (e.g., commitment to sea level rise)
  - There is high confidence that neither adaptation nor mitigation alone can avoid all climate change impacts

Stabilization Scenarios: General Concepts

- To stabilize GHGs in the atmosphere, emissions need to peak and decline thereafter
  - Delayed emission reductions significantly constrain the opportunities to achieve lower stabilization levels, and increase risk of more severe climate change impacts
  - Stabilization at lower concentration and associated temperature increases advances the date when emissions need to peak, and requires greater emissions reductions by 2050
  - Mitigation efforts over the next 2-3 decades will have a large impact on opportunities to achieve lower stabilization levels
- Climate sensitivity (how much warming for a given increase in concentrations) is a key uncertainty for mitigation scenarios that aim to meet specific temperature targets

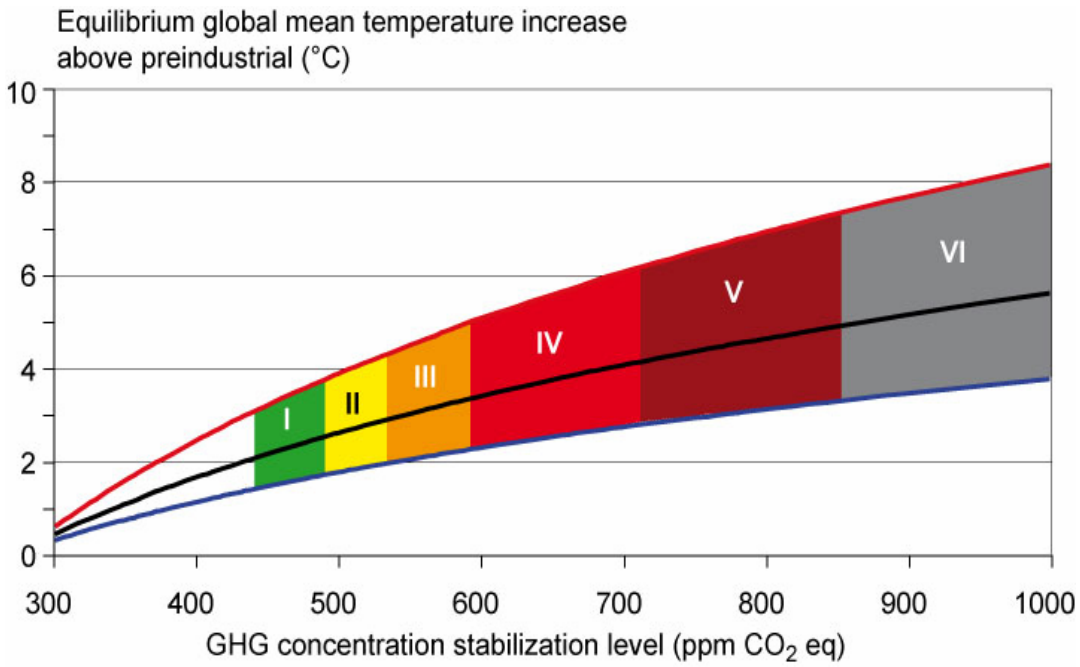


Figure shows range of long-term global temperature increases for different stabilization levels, and high/medium/low climate sensitivity assumptions

Source: IPCC 2007 AR4 Synthesis Report

IPCC on Benefit/Cost & Risk Management Strategies

- Limited and early analytical results from integrated analyses of the costs and benefits of mitigation indicate that these are broadly comparable in magnitude, but do not as yet provide an unambiguous determination of an emissions pathway or stabilization level.
  - IPCC offers SCC approach with values ranging from -3 - 130 $/tCO$_2$ (US).

- Decision-making about responding to climate change involves an iterative risk management process that includes both mitigation and adaptation, taking into account avoided and actual climate change damages, co-benefits, sustainability, equity, and attitudes towards risk.

- Risk is generally understood to be the product of the likelihood of an event and its consequences.

- Risk management… requires information about not only impacts resulting from the most likely climate scenarios, but also impacts arising from lower-probability but higher-consequence events and the consequences of proposed policies and measures.

The Climate Research Community Suggests a Risk Management Strategy

Risk management approach:

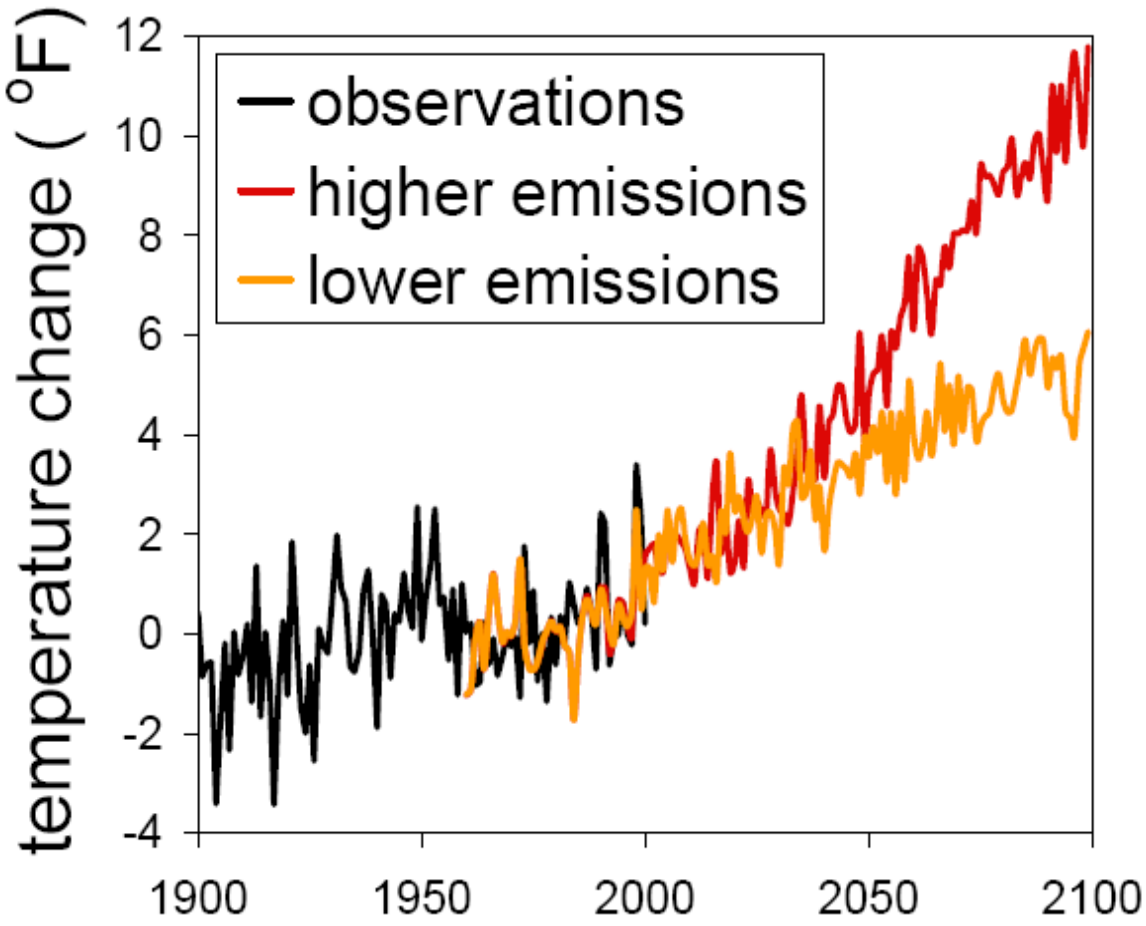
- Does not fit traditional cost-benefit approach
- Analyses need to show both action and no action, and show range of possible outcomes
- Characterizing uncertainties will be important
- Good communication of analyses will be important

% Risk of exceeding temperature thresholds at different stabilisation levels

	750 ppm CO2e	550 ppm CO2e	500 ppm CO2e	450 ppm CO2e
2 C	100	99	96	78
3 C	99	69	44	18
4 C	82	24	11	3
5 C	47	7	3	1

Webster, M. et al. (2003) Uncertainty Analysis of Climate Change and Policy Response, *Climatic Change* 61(3): 295-320.

Adaptation, Mitigation & Impacts Issues



Near-term (before 2050) climate change is less sensitive to future emissions path

- adaptation will be necessary unless impacts are considered 'acceptable'

Longer-term (after 2050) climate change will depend more on emissions pathway, and therefore extent of mitigation

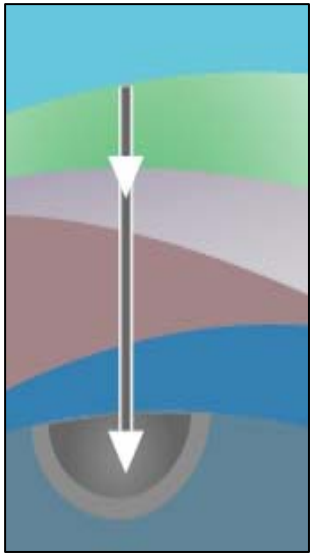
- wider range of potential impacts; wider range of adaptation needs
- some impacts (and some adaptation needs) can be avoided through mitigation

Source: UCS 2006 Climate Change in the US Northeast

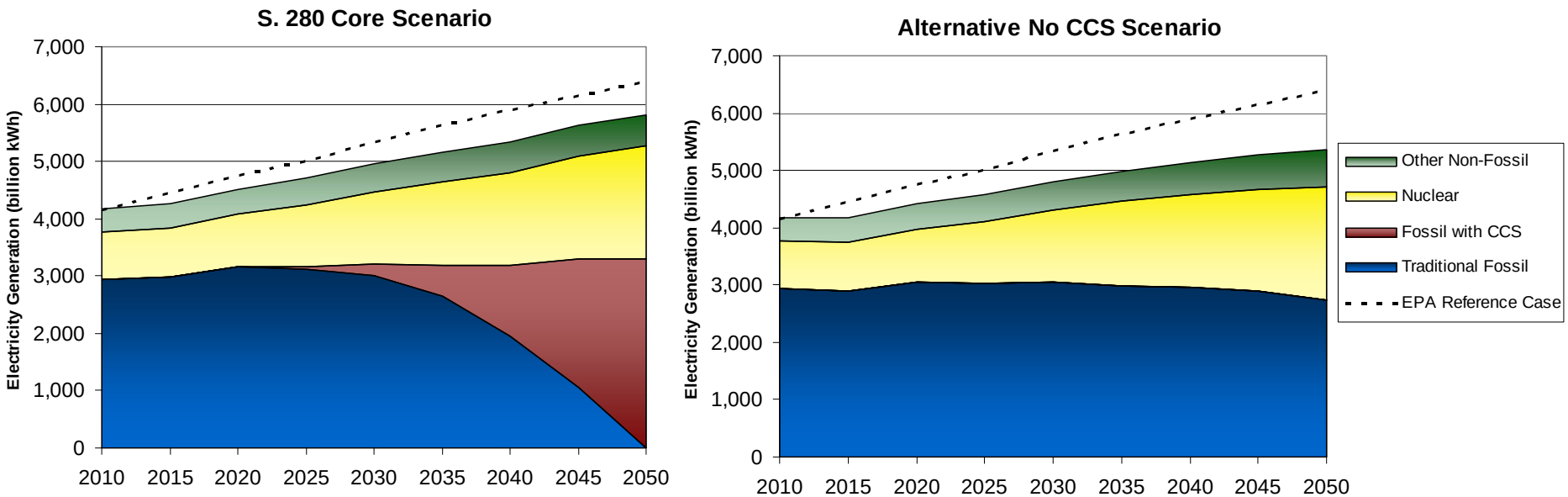
Assessing Climate Change Policy Through Technology and Environmental Assessment: Geologic Carbon Sequestration

Focus on evaluating the feasibility, timing, and scale of geologic carbon sequestration as a climate mitigation technology.

- An important climate-mitigation technology
- Risk assessment, risk management and risk communication are all important
- EPA activities:
  - Assessing hurdles (potential vulnerabilities, socio-economic) to long-term deployment of geologic sequestration
  - Reviewing and permitting projects
    - Developing regulatory framework under UIC program (SDWA)
  - Collaborate with international and domestic researchers
  - Sponsoring research in key areas:
    - CO2 leakage vulnerability, chemical fate/transport, impacts on ground water quantity and quality
  - Conducting economic modeling
  - Work closely with DOE and EPA/ORD to support ongoing R&D
- Public perception and acceptance are increasingly important



Illustrative Role of CCS in Climate Policy



	2030		2050	
	S. 280 Senate Scenario	S. 280 No CCS Scenario	S. 280 Senate Scenario	S. 280 No CCS Scenario
GDP (% change from BAU)	-0.55%	-0.97%	-1.07%	-1.82%
Allowance Price (2005 $/t$CO_2$e)	$26.59	$39.90	$70.33	$105.23

- Assumes no CCS technology is available
- Results in 50% higher allowance prices
- Results in reduced electricity generation

Note: Other non-fossil includes hydro, geothermal, wind, solar, biomass and municipal solid waste.

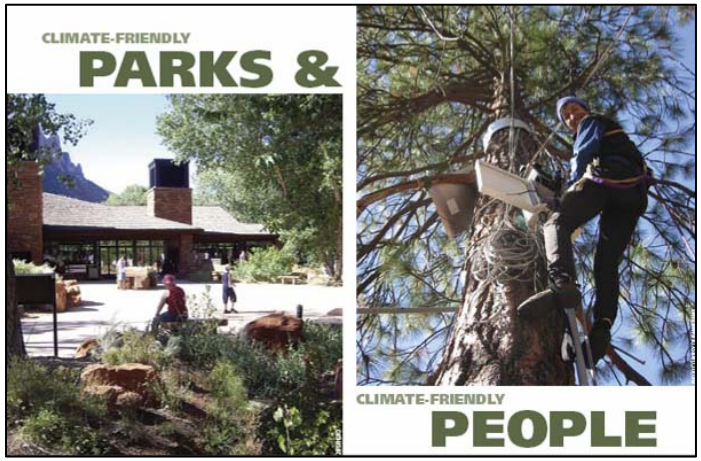
Opportunities for Collaboration …. there are many

- Telling a national climate change story can be told through a variety of lenses …both analytical and communication opportunities.
- Share analytical tools to assess market and non-market impacts …. Can we link tools?
- Are we ready to adapt? Does an infrastructure to facilitate decision-making exist?
  - Leveraging research; making priorities for investments; understanding the barriers; costs and benefits; best practices; accountability

Climate Friendly Parks

An EPA/Park Service partnership created in 2003:

- Conduct emissions inventories within National Parks
- Develop action plan for emissions reductions and mitigation in Parks
- Educate park staff on climate change and communicate with the public
- Beginning to leverage impacts research and consider adaptation

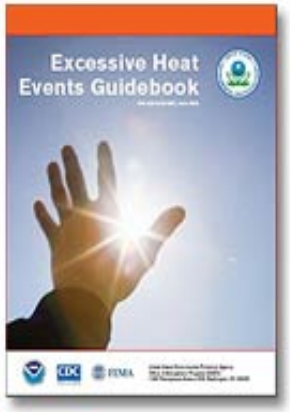


Some Parks in the Program

Gateway NRA (June 2003)
Glacier NP (April 2004)
Zion NP (September 2004)
Everglades NP (June 2005)
Glacier Bay NPP (October 2005)
Delaware Water Gap NRA (November 2005)
Yosemite NP (April 2006)
Great Smoky Mountains NP (December 2006)
Hawai'i Volcanoes NP (February 2007)
Rocky Mountain NP (March 2007)
Apostle Islands NL (July 2007)
Pictured Rocks NL (July 2007)
Wolf Trap NPPA (October 2007)
Sequoia and Kings Canyon NP (April 2008)
Bandelier NM (May 2008)

Excessive Heat Events (EHE) Guidebook and Best Practice Information

- Developed in 2006 through an EPA, CDC, NOAA partnership.
- Provide local public health officials and others with convenient access to critical EHE information:
  - Options for defining EHE conditions
  - How to assess local vulnerability to EHEs
  - Case studies (lessons learned)
  - A “menu” of public education, notification, and response actions to consider when developing or enhancing an EHE notification and response program
- Ongoing effort to build upon this work.



Also see…
Heat Island Analyses
http://www.epa.gov/heatisland/

Climate Ready Estuaries

- Partnership between the 28 National Estuary Programs (NEPs) and EPA's Climate Change and Oceans and Coastal Protection Divisions.
  - Supported by EPA/ORD
- Purpose:
  - Build capacity in the NEPs to adapt to climate change.
  - Combine NEP local knowledge and skills with EPA's coastal adaptation expertise.
  - Advance the utilization of adaptation science and technology.
- Approach:
  - Provide broadly applicable information and management resources to all NEPs.
  - Work with a small group of pilot NEPs to better understand vulnerabilities and develop adaptation plans.

CLIMATE READY ESTUARIES

EPA

Climate Ready Estuaries
2008 Pilots

- Selected six diverse NEPs to help inform the pilot process and program development.
- EPA support includes technical support and direct financial assistance.
- Six Pilot Partners selected for 2008:
  - Albemarle-Pamlico NEP
  - Charlotte Harbor NEP
  - Partnership for the Delaware Estuary
  - New Hampshire Estuary Project
  - Massachusetts Bays Program
  - San Francisco Estuary Project

Partnerships with Regions

- Work collaboratively to identify analytical needs/questions and communication opportunities across the Agency.
- Completed work with Region 10 to leverage existing research in assessing biophysical and economic impacts of climate change on the Alaskan king crab fishery.
- Beginning work with Regions 2, 3, and the Partnership for the Delaware Estuary (PDE)
  - Estimate the economic value of ecosystem services lost to sea level rise.
  - Leverage sea level rise data/maps, along with data from PDE and New Jersey.

Thank You!

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EPA's Climate Change website:
www.epa.gov/climatechange