Climate Change Impacts in the United States

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Global Change Research Act (1990):

“To provide for development and coordination of a comprehensive and integrated United States 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.”
The Third National Climate Assessment

Goal

• Enhance the ability of the United States to anticipate, mitigate, and adapt to changes in the global environment.

Vision

• Advance an inclusive, broad-based, and sustained process for assessing and communicating scientific knowledge of the impacts, risks, and vulnerabilities associated with a changing global climate and to support of decision-making across the United States.
Human-induced climate change has moved firmly into the present.

Photo: Cedar Rapids, IA during the 2008 flooding
Source: AP photo/Jeff Robertson
Americans are already feeling the effects of increases in some types of extreme weather and sea level rise.
Impacts are apparent in every region and in important sectors including health, water, agriculture, energy, etc.
There are many actions we can take to reduce future climate change and its impacts, and to prepare for the impacts we can’t avoid.
The NCA Process

Inclusive, broad expertise
- 60 member Federal Advisory Committee
- 300 authors

Public engagement
- Listening sessions around the country
- Request for information, input reports

Focus on sustaining the assessment
- Continued engagement and intermediate products planned as well as quadrennial reports
The NCA Process, continued

*New topics covered*
- Oceans, Coasts, Urban, Rural, Land use
- Mitigation, Adaptation, and Decision Support
- Cross-sectoral links such as Energy/Water/Land

*New format*
- Digital products and interactive website
- Highlights, GCIS, traceable accounts

*Extensive Review, of course!*
- National Academy of Sciences, agencies, public review, responses to all comments
Sectors

- Water Resources
- Energy Supply and Use
- Transportation
- Agriculture
- Forestry
- Ecosystems and Biodiversity
- Human Health
Sectoral Cross-Cuts

- Water, Energy, and Land Use
- Urban Systems, Infrastructure, and Vulnerability
- Impacts of Climate Change on Tribal, Indigenous, and Native Lands and Resources
- Land Use and Land Cover Change
- Rural Communities
- Biogeochemical Cycles
Responses

- Decision Support
- Mitigation
- Adaptation
- Research Needs
- The Sustained Assessment Process
Climate Change Impacts in the U.S.

- Full report (digital)
  - Interactive, web-based
  - Includes traceable accounts
  - Linked to data and sources

- Website (http://nca2014.globalchange.gov)
  - Full report & Highlights in HTML
  - Graphics (high-resolution files, interactive figures)
  - Supporting information

- Highlights (148 pp) (printed & pdf)

- Overview (20 pp) (printed & pdf)

- Climate Science & Regional Fact Sheets
- (2 pp each) (pdf)
Sample pages from Highlights

**CLIMATE TRENDS**

Climate change is already affecting the American people. Changes in individual weather events can be attributed to climate change, while long-term changes can be attributed to climate change that occurred over several decades or centuries. Global climate change is projected to continue over the next century.

- **Temperature**
  - U.S. average temperature has increased by about 1.7°F since 1880.
  - Most of this increase has occurred since 1930.

- **Precipitation**
  - Average U.S. precipitation has increased since 1960.

- **Ocean Acidification**
  - The ocean is warming, and its acidification is accelerating.

- **Savage Storms**
  - Winter storms have increased in the U.S.

**INFRASTRUCTURE**

Infrastructure is being damaged by sea level rise, heavy rains, and extreme heat. Damage to infrastructure is projected to increase with continued climate change. The coastal and inland infrastructure is particularly vulnerable, and as the climate changes, these systems will continue to be affected by various climate-related events and processes.

**KEY MESSAGES: URBAN SYSTEMS, INFRASTRUCTURE, AND VULNERABILITY**

Urban infrastructure, such as water and sewer systems, roads, bridges, and power plants, is subject to aging and wear and tear, leading to increased costs and decreased efficiency. Urban systems are also vulnerable to extreme weather events, leading to increased costs and decreased efficiency. Urban systems are particularly vulnerable to climate change because of their dependence on infrastructure for energy, water, and transportation. Infrastructure is also vulnerable to extreme weather events, leading to increased costs and decreased efficiency.

**Global Change.gov**

U.S. Global Change Research Program
Ten Indicators of A Warming World

- Sea Surface Temperature
- Temperature Over Oceans
- Water Vapor
- Air Temperature Near Surface (Troposphere)
- Glaciers and Ice Sheets
- Snow Cover
- Sea Ice
- Sea Level
- Temperature Over Land
- Ocean Heat Content
Observed U.S. Precipitation Change
Observed U.S. Trends in Heavy Precipitation

Relative Number of Extreme Events (%)

Decade

1900s 1910s 1920s 1930s 1940s 1950s 1960s 1970s 1980s 1990s 2000s
Observed Change in Very Heavy Precipitation

Change (%)

-0  0-9  10-19  20-29  30-39  40+

<0  0-9  10-19  20-29  30-39  40+

GlobalChange.gov
U.S. Global Change Research Program
Trends in Flood Magnitude
Observed U.S. Temperature Change
Observed Increases in Frost-Free Season

Change in Annual Number of Days

- 0-4
- 5-9
- 10-14
- 15+

GlobalChange.gov
U.S. Global Change Research Program
Mitigation
Adaptation
Adaptation is still very nascent!

There is no "one-size fits all" adaptation, but there are similarities in approaches across regions and sectors.

We need to begin sharing best practices and "lessons learned" so wise practices can be put in place.
Adaptation can yield Co-Benefits: Address Existing Stressors & Enhance Resilience to climate change

- Updating zoning in Cambridge, MA – no new basement apartments?
- Urban heat island mitigation in NYC via cool roofs; and Chicago’s green roofs
- Reducing fire risk in Flagstaff, AZ
- Sea level rise preparedness in Miami-Dade County, FL
- Water conservation in Santa Clara, CA
- Increasing storm pipe diameter in Keene, NH
- Urban forestry program in Dayton, OH reduces stormwater run-off by 7%
- Plant city trees that will persist in warmer temps, Ann Arbor MI
In 2006, Ann Arbor updated the rate structure for its stormwater utility to charge owners based on the amount of impervious surface and to include incentives to manage stormwater.

Green-talk.com
The City of Grand Rapids, MI has a Sustainability Plan that incorporates adaptation to climate change in all its actions.

A new downtown Market focused on local produce has a green roof, live walls, geothermal wells, rain gardens, and the nation’s first demonstration kitchen for kids.
Flint’s updated Master Plan includes “adapting to climate change” with strategies e.g.,

• Using plant materials that are resilient to anticipated climate change;
• blue-green infrastructure to protect the Flint River from development, pollution, and to manage flooding & stormwater.
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