Climate Change Impacts in the United States – and Beyond

BU GLACIER Lecture
3 August 2016
Outline

- Context
- What do we know, and how do we know?
- Implications for the future
- Actions for today
Quality of Life Issues for All of Us
Why Does This Matter?

- Because the global environmental changes about which we are rightly concerned have immediate local implications.
- As well as implications for decades to come.
- Are quality of life issues for residents and the entire region.
- Do not have the luxury to ignore what the facts tell us, or the experiences of others.
- Recognize that we are collectively managing risks even as we seek to understand more.
A Long History

For over 25 years in the US, the federal government agencies have collaborated on all the fields of climate science.

For the past 15, we have published our assessments of the state of the science regarding impacts in the US.

Paralleling the international scientific assessment process.

Where have we been, and where are we now in our understanding?
A History of US Assessments

CLIMATE CHANGE IMPACTS ON THE UNITED STATES
The Potential Consequences of Climate Variability and Change

National Assessment Synthesis Team
US Global Change Research Program

Public Comment Period:
June 12 to August 12
Third National Climate Assessment

Climate Change Impacts in the United States
Human-induced climate change has moved firmly into the present.
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, and more.
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 World is Warming

Numerous independent lines of evidence demonstrate that warming has continued.

Because human-induced warming is super-imposed on a naturally varying climate, rising temperatures are not evenly distributed across the globe or over time.
Global Temperature and Carbon Dioxide
Temperature Change by Decade

- 2001-2012 even warmer. Every year warmer than 1990s average.
- 1990s even warmer. Every year warmer than 1980s average.
- 1980s warmest decade on record at the time.
Arctic Sea Ice Decline

September 14, 1984

September 13, 2012

Sea Ice Concentration (percent)

0 50 100
Ice Loss from the Two Polar Ice Sheets

Greenland Ice Mass

Antarctica Ice Mass

Change from Average (Gigatons)

Year

Human activity is the primary cause
Carbon Emissions in the Industrial Age
Major North American CO$_2$ Sources and Sinks

![Graph showing CO$_2$ sources and sinks in North America. The main source is fossil fuels, with significant contributions from forestland and cropland. Other sources and sinks are also depicted.](image-url)
Impacts Are Already Widespread
Sea Level is Rising

Data from Permanent Service for Mean Sea Level
Water Stress in the U. S.
Increase in Cooling Demand and Decrease in Heating Demand
Paths of Hurricanes Katrina and Rita Relative to Oil and Gas Production Facilities
Gulf Coast Transportation Hubs at Risk
California Power Plants Potentially at Risk from Sea Level Rise

Figure source: Sathaye et al. 2011
Impacts are Projected to Increase
Projected Global Temperature Change
Past and Projected Changes in Global Sea Level
The international process has led to strikingly similar conclusions
CLIMATE CHANGE 2014:
IMPACTS, ADAPTATION, AND VULNERABILITY
So What Do We Do?
New U.N. Climate Report, in Brief

Your goose is cooked.

We have only ourselves to thank.
Responses

There are important opportunities to reduce future warming by reducing greenhouse gas emissions and increasing carbon dioxide uptake.

There are also actions we can take to prepare for impacts that are already unavoidable.

Some actions are already underway.
Mitigation
Future Climate Change Depends Primarily on Emissions Levels
Mitigation


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Key Message 1

• Carbon dioxide is removed from the atmosphere by natural processes at a rate that is roughly half of the current rate of emissions from human activities.

• Mitigation efforts that only stabilize global emissions will not reduce atmospheric concentrations of carbon dioxide, but will only limit their rate of increase.

• The same is true for other long-lived greenhouse gases.
Adaptation
Lots of Local Action
Sea Level Rise & the Future of Coastal Cities
### Priorities

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<th>Reduce Greenhouse Gas Emissions Below 2005 Levels</th>
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<td>- 25 percent by 2020 and 80 percent by 2050</td>
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<td>- Expand energy efficiency programs through</td>
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<td>targeted outreach and new financing mechanisms.</td>
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<tr>
<td>- Increase local and low-carbon energy sources,</td>
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<td>including expanding district energy and</td>
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<tr>
<td>co-generation.</td>
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<td>- Re-envision Boston’s transportation system to</td>
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<td>dramatically reduce emissions from this sector.</td>
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<th>Promote Healthy and Equitable Communities</th>
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<td>- Encourage sustainable development that creates</td>
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<td>opportunities for current and future residents.</td>
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<td>- Ensure equitable access to green jobs and</td>
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<tr>
<td>facilitate job training.</td>
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<td>- Implement Housing a Changing City, the</td>
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<td>2015-2021 Open Space plans</td>
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<td>- Promote equity in all policies and programs.</td>
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<th>Measure Progress</th>
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<td>- Track and publicly report on the Climate</td>
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<td>Action Plan’s progress year-over-year.</td>
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<td>- Use performance measurement, targets and</td>
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<td>goals to motivate climate action and</td>
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<td>behavior change.</td>
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<th>Prepare Boston for the Impacts of Climate Change</th>
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<td>- Work with regional and state agencies, and</td>
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<td>surrounding communities to align and</td>
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<td>accelerate regional preparedness planning.</td>
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<td>- Incorporate climate preparedness into existing local planning and community engagement efforts.</td>
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<td>- Ensure public- and private-sector developments and major capital projects are prepared for expected climate change over their projected life.</td>
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<th>Increase Community Engagement</th>
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<td>- Support grassroots, community-driven climate action efforts.</td>
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<td>- Incorporate sustainability into all aspects of education.</td>
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Sustainability Plans for every Federal Agency
Effectiveness?

- Plans more than actions
- Challenge of developing a counterfactual
- Academic knowledge not yet penetrating private and public institutions
- Private and public experience not yet penetrating academic institutions
Future assessments clearly need to evaluate where scientific knowledge is moving.

At the same time, keep track of progress on responses to climate change.
Keep Your Eye on the Ball

CAUTION
THIS SIGN HAS SHARP EDGES
DO NOT TOUCH THE EDGES OF THIS SIGN
ALSO, THE BRIDGE IS OUT AHEAD
Concluding Thoughts

- We are clearly seeing the consequences of changes in the climate system.
- While we typically don’t use the phrase “settled science,” there is a lot of what we do know that is simply not in serious question.
- But we do have a very challenging problem of communicating.
Concluding Thoughts

- We need to acknowledge that the world will not wait while we sort out the things we’re not so sure about.

- We are managing risks as well as seeking to understand the world better.

- The very epitome of being useful while being interesting.
Thank you...
Analysis for a better tomorrow, today.

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