



National Institute of Environmental Health Sciences
Your Environment. Your Health.

Climate Change and Human Health: Impacts, vulnerability, protection

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National Institute of Environmental Health Sciences

Worker Training Program Workshop

RTP, North Carolina

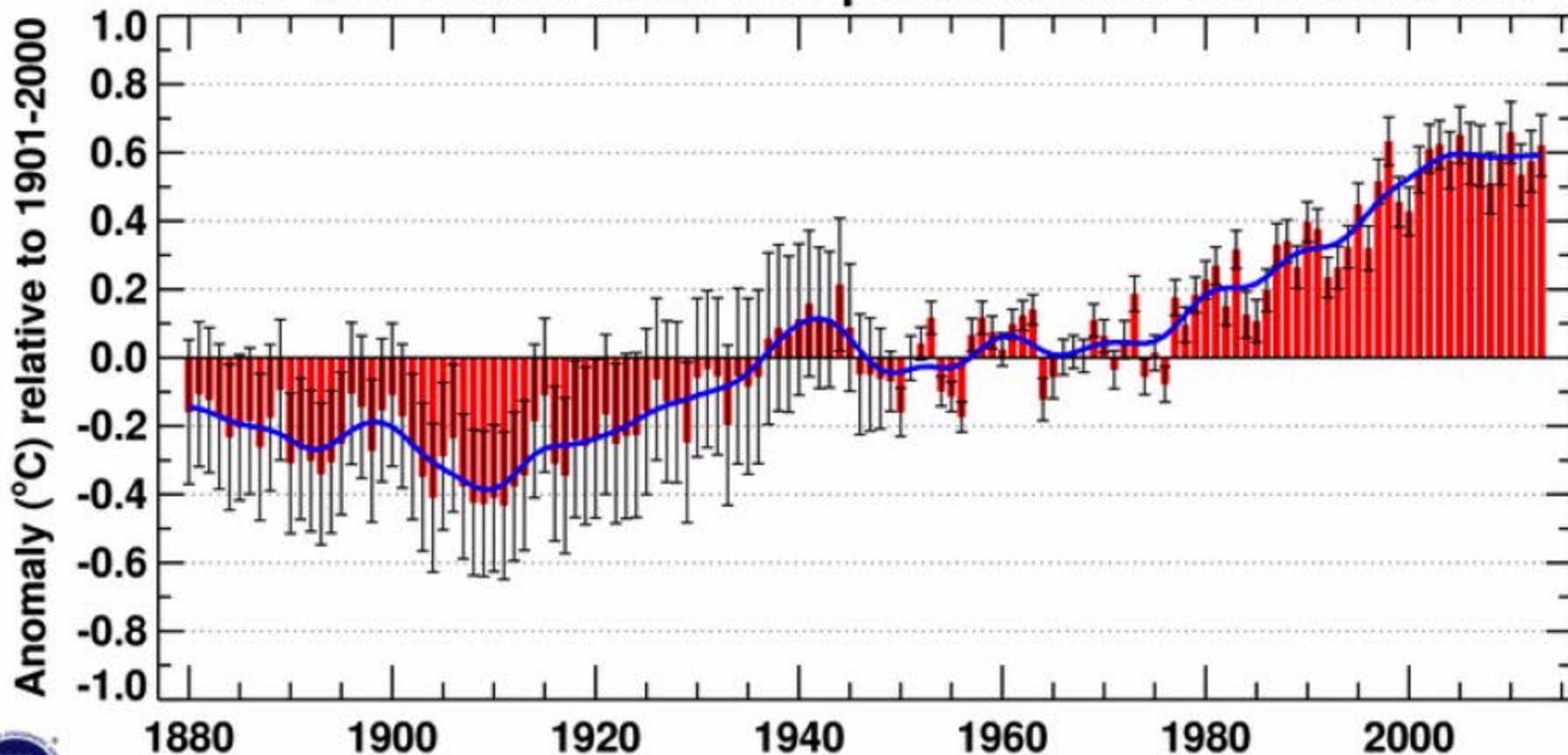
October 7, 2014



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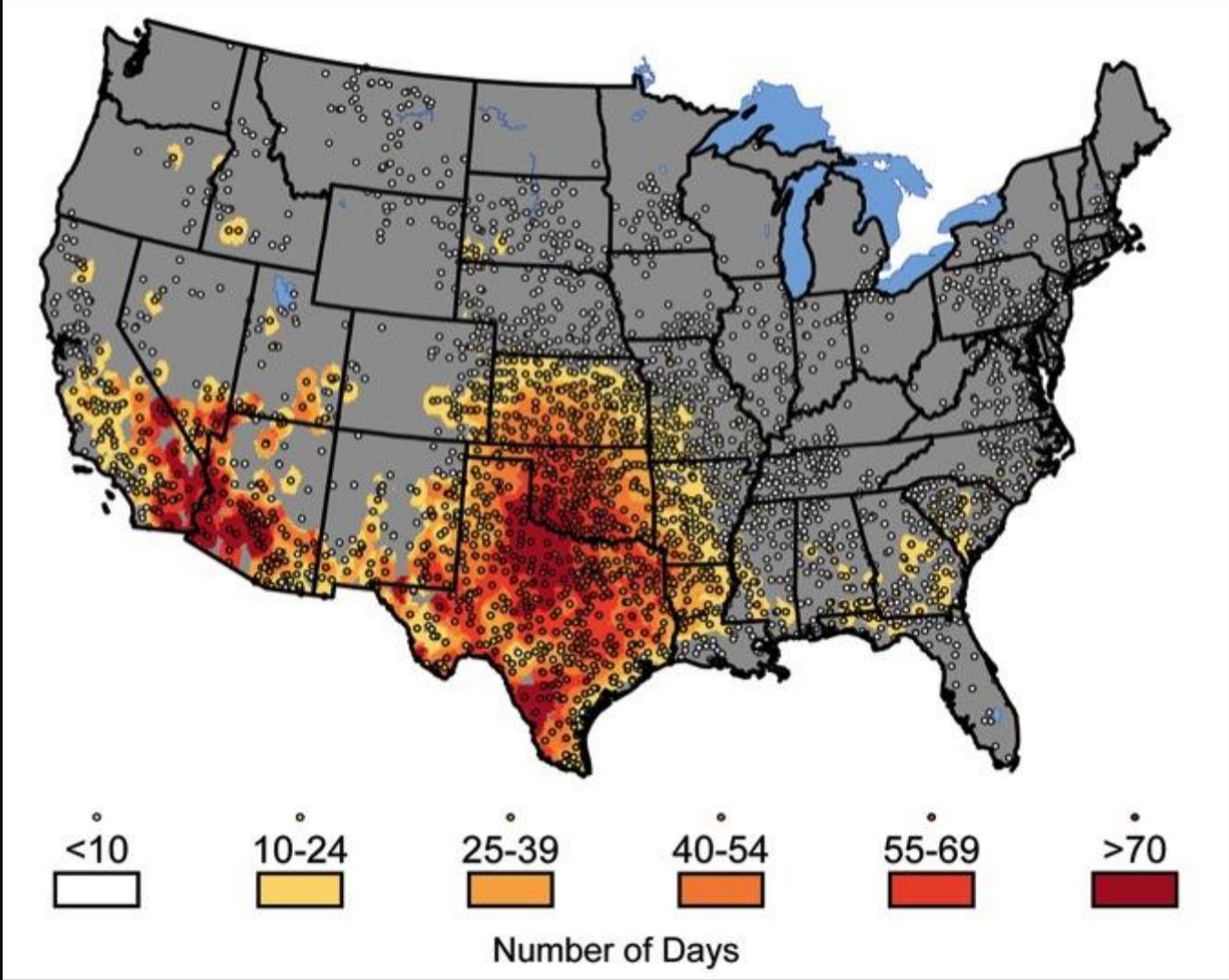
Jan-Dec Global Mean Temperature over Land & Ocean



NCDC/NESDIS/NOAA

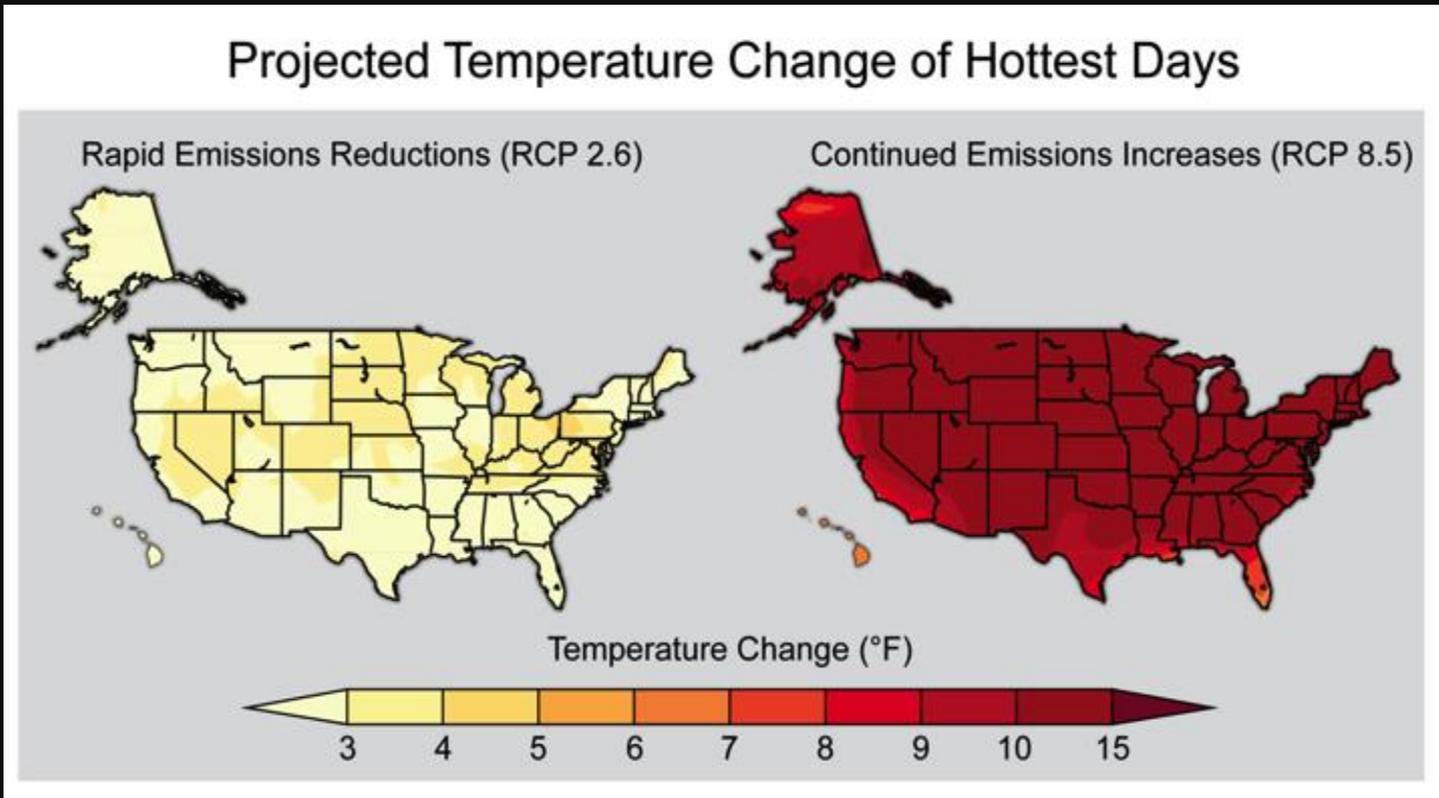


100-degree Days in 2011





Projected Temperature Change of Hottest Days

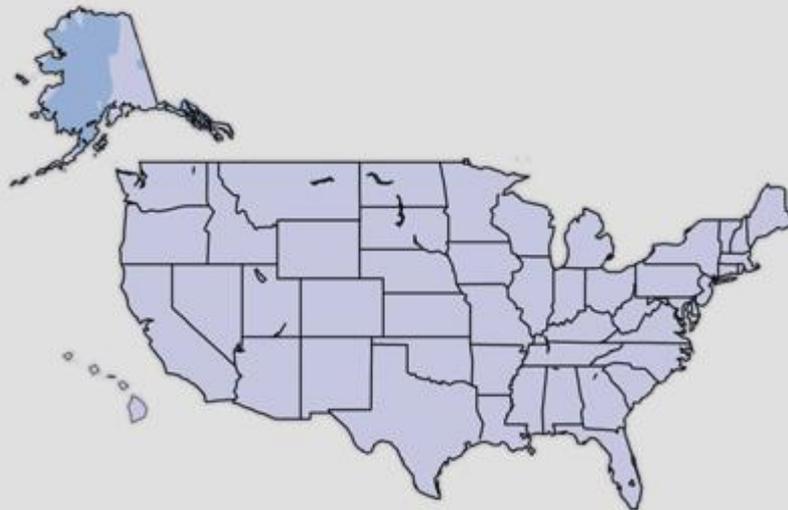




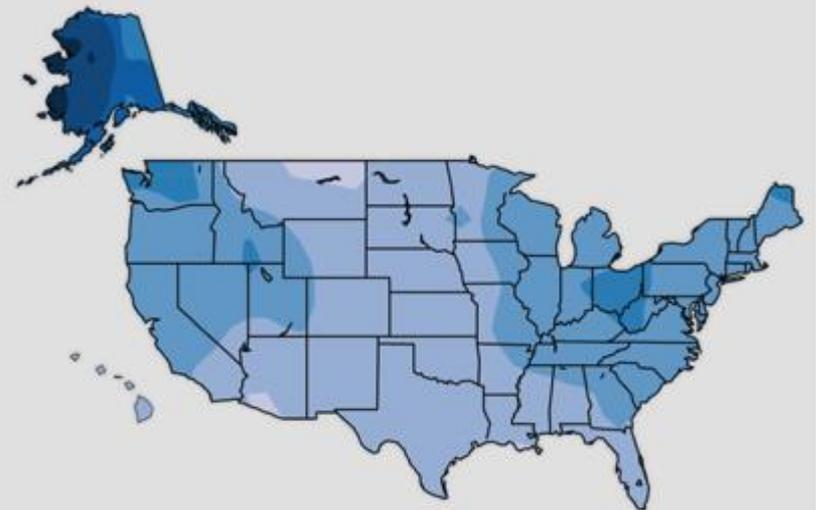
Projected Change in Heavy Precipitation Events

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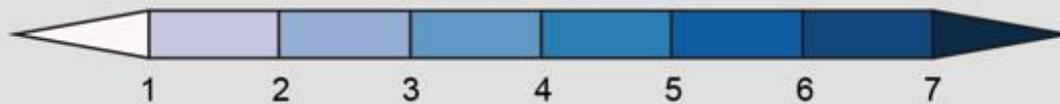
Rapid Emissions Reductions (RCP 2.6)



Continued Emissions Increases (RCP 8.5)

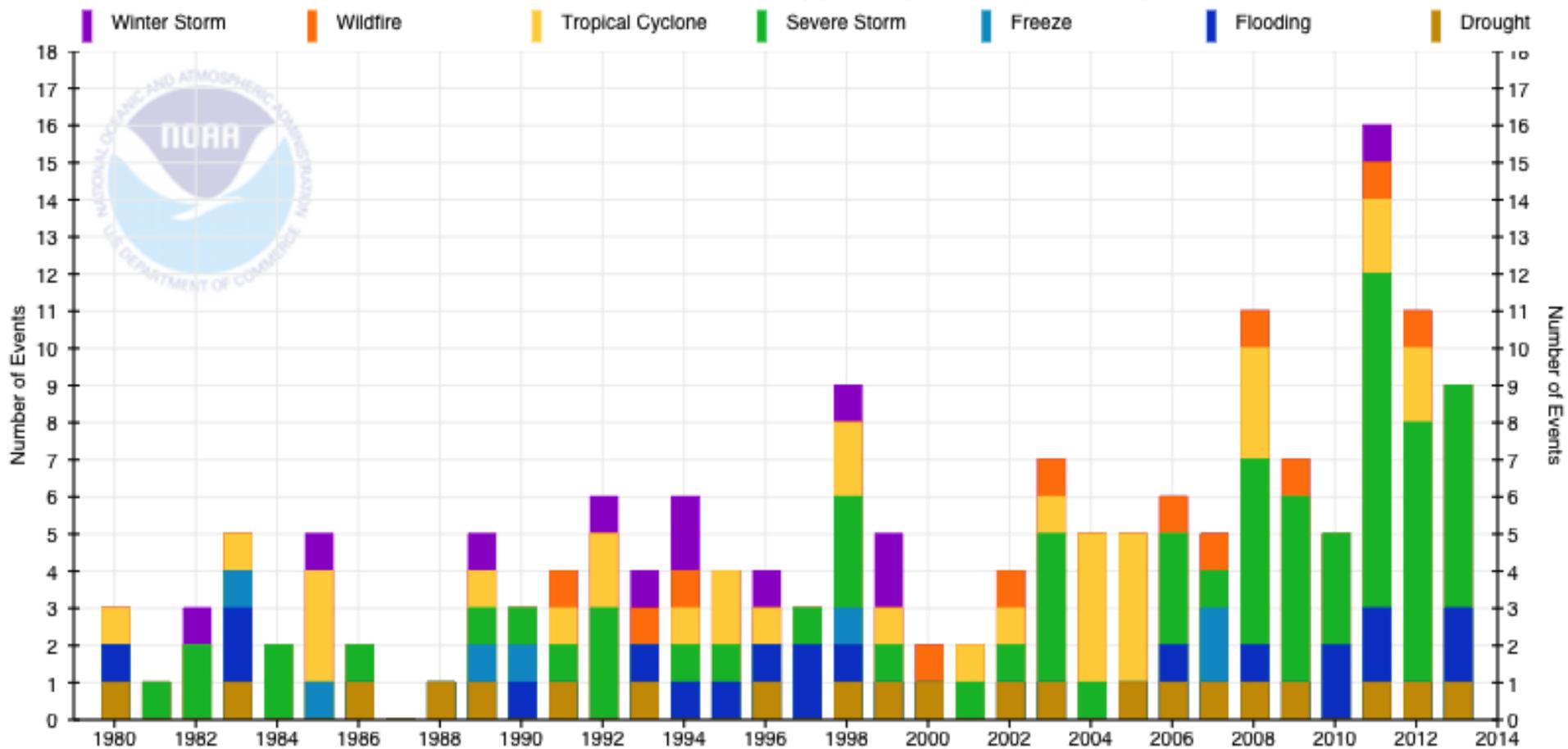


Future Change Multiplier



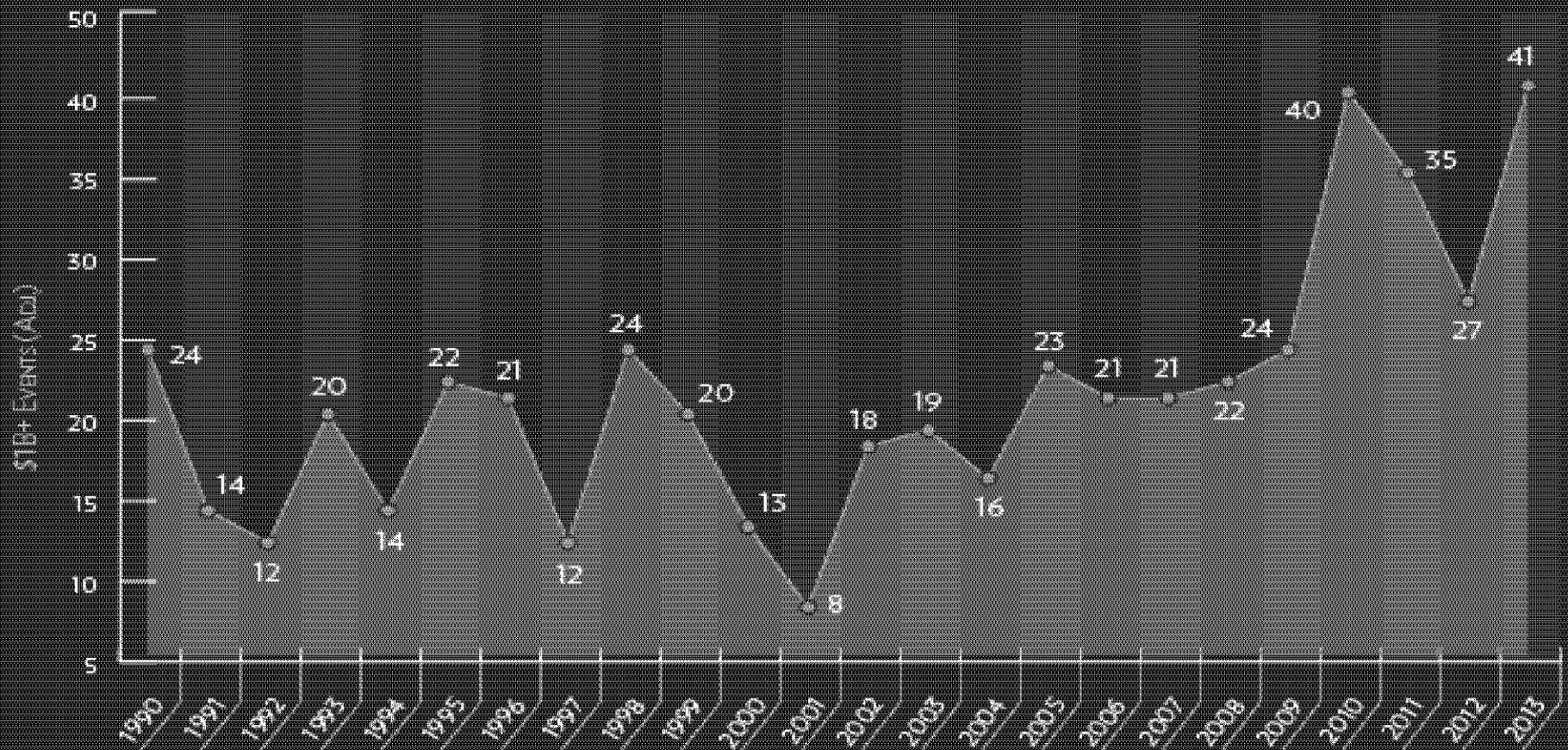
Extreme events trend upwards in US since 1980

Billion-Dollar Disaster Event Types by Year (CPI-Adjusted)



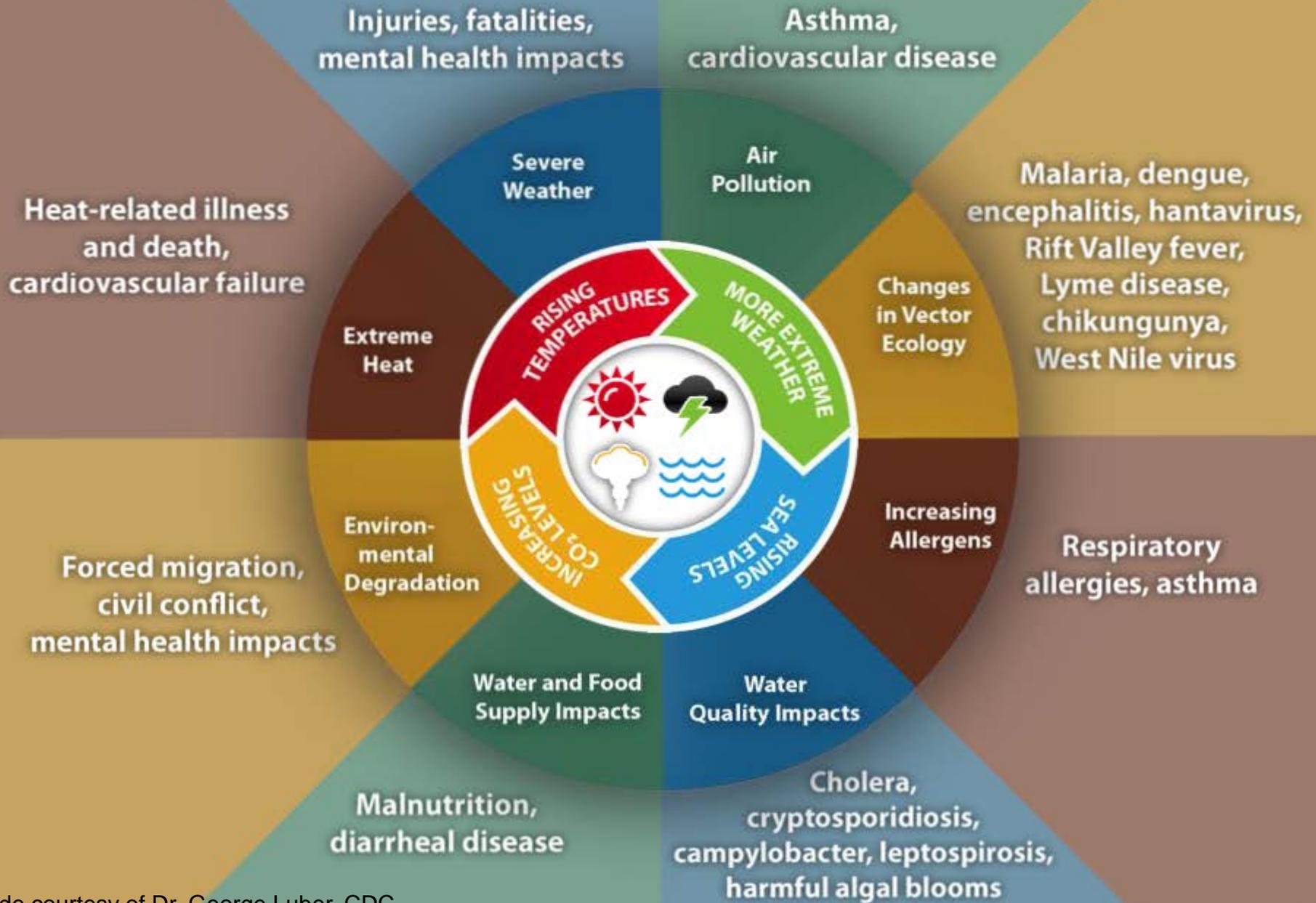
Global Billion-Dollar Weather-Related Disasters

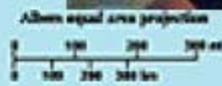
Since 1990



NOTE: Inflation-adjusted
Data prior to 2000 is questionable for Asia and Latin America
Source: Aon Benfield

Impact of Climate Change on Human Health





Welcome to the National Climate Assessment

The National Climate Assessment summarizes the impacts of climate change on the United States, now and in the future.

A team of more than 300 experts guided by a 60-member Federal Advisory Committee produced the report, which was extensively reviewed by the public and experts, including federal agencies and a panel of the National Academy of Sciences.



EXPLORE THE EFFECTS OF CLIMATE CHANGE



GlobalChange.gov

U.S. Global Change Research Program



National Institutes of Health
U.S. Department of Health and Human Services

Key Message 1: Wide-ranging Health Impacts

Climate change threatens human health and well-being in many ways, including impacts from increased extreme weather events, wildfire, decreased air quality, threats to mental health, and illnesses transmitted by food, water, and disease-carriers such as mosquitoes and ticks. Some of these health impacts are already underway in the United States.



Supporting Evidence

Key Message 2: Most Vulnerable at Most Risk

Climate change will, absent other changes, amplify some of the existing health threats the nation now faces. Certain people and communities are especially vulnerable, including children, the elderly, the sick, the poor, and some communities of color.



Supporting Evidence

Key Message 3: Prevention Provides Protection

Public health actions, especially preparedness and prevention, can do much to protect people from some of the impacts of climate change. Early action provides the largest health benefits. As threats increase, our ability to adapt to future changes may be limited.

 Supporting Evidence

Key Message 4: Responses Have Multiple Benefits

Responding to climate change provides opportunities to improve human health and well-being across many sectors, including energy, agriculture, and transportation. Many of these strategies offer a variety of benefits, protecting people while combating climate change and providing other societal benefits.

 Supporting Evidence



The President's Climate Action Plan- June 2013

THE PRESIDENT'S PLAN WILL
PREPARE THE U.S. FOR THE IMPACTS OF CLIMATE CHANGE
WE'VE MADE GREAT PROGRESS



The Administration and partners developed national strategies to help decision makers address the impacts of climate change on freshwater resources — fish, wildlife, and plants — and oceans.

PROGRESS: 

In 2013, federal agencies released Climate Change Adaptation plans for the first time, outlining strategies to protect their operations, missions, and programs from the effects of climate change.

PROGRESS: 

The US Global Change Research Program, NOAA, USACE, and FEMA developed and released interactive sea-level rise maps and a calculator to aid rebuilding efforts in NY and NJ after Superstorm Sandy.

THERE'S MORE WORK TO DO
 Moving forward, the Obama Administration will help states, cities, and towns build stronger communities and infrastructure, protect critical sectors of our economy as well as our natural resources, and use sound science to better understand and manage climate impacts.



SUPPORT CLIMATE-RESILIENT INVESTMENTS
 at the community level by removing policy barriers, modernizing programs, and establishing a short-term task force of state, local, and tribal officials to advise on key actions the federal government can take to support local and state efforts to prepare for climate change.

REBUILD AND LEARN FROM SUPERSTORM SANDY
 by piloting innovative strategies in the Superstorm Sandy-affected region to strengthen communities against future extreme weather and other climate impacts and building on a new, consistent flood risk reduction standard established for the Sandy-affected region, agencies will update their flood-risk reduction standards for all federally-funded projects.



LAUNCH AN EFFORT TO CREATE SUSTAINABLE AND RESILIENT HOSPITALS
 in the face of climate change through a public-private partnership with the healthcare industry.



PROVIDE TOOLS FOR CLIMATE RESILIENCE
 including existing and newly developed climate preparedness tools and information that state, local, and private-sector leaders need to make smart decisions.

Some important acronyms

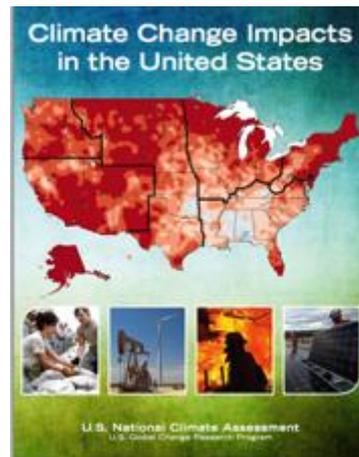
- **USGCRP:** United States Global Change Research Program

The U.S. Global Change Research Program is a confederation of 13 Federal departments and agencies, which carry out research and develop and maintain capabilities that support the Nation's response to global change.



- **NCA:** National Climate Assessment

USGCRP has a legal mandate to conduct a National Climate Assessment every four years, the most recent of which was released in May 2014.



- **CCHHG:** Interagency Workgroup on Climate Change and Human Health

Leads and coordinates Federal scientific activities related to climate change and human health in an end-to-end manner, from basic research through public health practice.

CCHHG: Interagency Workgroup on Climate Change and Human Health

○ Co-chairs:

- National Institute of Environmental Health Sciences (NIEHS)
- Centers for Disease Control and Prevention (CDC)
- National Oceanographic and Atmospheric Administration (NOAA)

○ Representatives:

- Department of Defense (DOD)
- Department of State (DOS)
- Environmental Protection Agency (EPA)
- Homeland Security (DHS)
- National Aeronautics & Space Administration (NASA)
- U.S. Agency for International Development (USAID)
- U.S. Department of Agriculture (USDA)
- U.S. Geological Survey (USGS)



The USGCRP Climate and Health Assessment is:

- **An Interagency Product**

of the USGCRP, coordinated by the Interagency Workgroup on Climate Change and Human Health (CCHHG) and written by federal experts (NIH, CDC, NOAA, EPA, others), with contractor support. EPA is playing a coordinating role.

- **A Scientific Assessment**

of existing research on the impacts of observed and projected climate change on human health in the United States, with a strong focus on impact quantification

- **An Interim Report**

with an estimated publication date in spring 2016 – between the Third NCA (May 2014) and Fourth NCA. It will build upon current NCA and 2008 US CCSP climate and health-focused SAP 4.6.

- **A Product with High Visibility**

The USGCRP Climate and Health Assessment is a Highly Influential Scientific Assessment and is featured as a goal in the President's Climate Action Plan to address the need for more definitive, quantitative assessments of the national burden of climate-health impacts.

Draft Outline

1. Introduction
2. Thermal Extremes
3. Air Quality Impacts
4. Vectorborne and Zoonotic Disease
5. Waterborne and Foodborne Disease
6. Food Safety, Nutrition, and Access
7. Extreme Weather and Climate Events
8. Mental Health and Stress-Related Disorders
9. Risk Factors and Populations of Concern

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9. Risk Factors and Populations of Concern

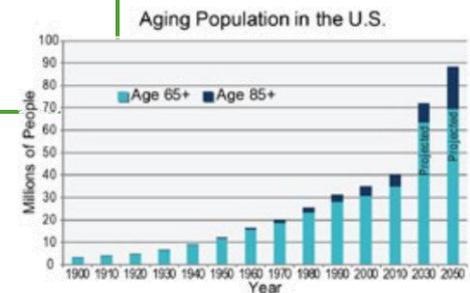


Risk Factors

- Social Determinants of Health
- Biological Sensitivity
- Exposure
- Resilience

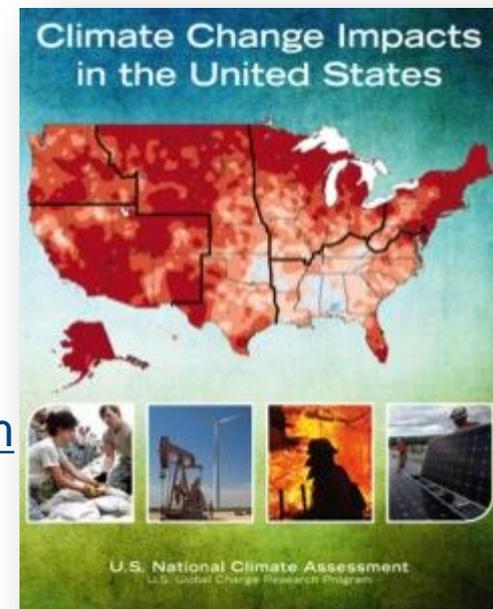
Populations of Concern

- Minority, Low Income, EJ
- Tribal Peoples
- Children and Pregnant Women
- Older Adults
- Occupational groups
- Persons with disabilities
- Persons with chronic diseases



Resources and activities for protecting health in a context of climate change

- CDC's BRACE framework and guidance documents
 - <http://www.cdc.gov/climateandhealth/default.htm>
- 3rd National Climate Assessment
 - <http://nca2014.globalchange.gov/report/sectors/human-health>
- USGCRP Climate Health Assessment
- Climate Resilience Tool Kit- launching spring 2015



An adaptability limit to climate change due to heat stress

Steven C. Sherwood^{a,1} and Matthew Huber^b

^aClimate Change Research Centre, University of New South Wales, Sydney, New South Wales 2052, Australia; and ^bPurdue Climate Change Research Center, Purdue University, West Lafayette, IN 47907

Edited by Kerry A. Emanuel, Massachusetts Institute of Technology, Cambridge, MA, and approved March 24, 2010 (received for review November 19, 2009)

Despite the uncertainty in future climate-change impacts, it is often assumed that humans would be able to adapt to any possible warming. Here we argue that heat stress imposes a robust upper limit to such adaptation. Peak heat stress, quantified by the wet-bulb temperature T_w , is surprisingly similar across diverse climates today. T_w never exceeds 31°C. Any exceedence of 35°C for extended periods should induce hyperthermia in humans and other mammals, as dissipation of metabolic heat becomes impossible. While this never happens now, it would begin to occur with global-mean warming of about 7°C, calling the habitability of some regions into question. With 11–12°C warming, such regions would spread to encompass the majority of the human population as currently distributed. Eventual warmings of 12°C are possible from fossil fuel burning. One implication is that recent estimates of the costs of unmitigated climate change are too low unless the range of possible warming can somehow be narrowed. Heat stress also may help explain trends in the mammalian fossil record.

climate impacts | global warming | mammalian physiology | paleoclimate

Heat stress is already a leading cause of fatalities from natural phenomena (11, 12). While fatalities appear associated with warm nights (13), hot days alter the lifestyles and work productivity of those living at low latitudes (14). Both impacts will clearly worsen in warmer climates (15, 16), but most believe humans will simply adapt, reasoning that humans already tolerate a very wide range of climates today. But when measured in terms of peak heat stress—including humidity—this turns out to be untrue. We show that even modest global warming could therefore expose large fractions of the population to unprecedented heat stress, and that with severe warming this would become intolerable.

A resting human body generates ~100 W of metabolic heat that (in addition to any absorbed solar heating) must be carried away via a combination of heat conduction, evaporative cooling, and net infrared radiative cooling. Net conductive and evaporative cooling can occur only if an object is warmer than the environmental wet-bulb temperature T_w , measured by covering a standard thermometer bulb with a wetted cloth and fully ventilating it. The second law of thermodynamics does not allow an object to lose heat to an environment whose T_w exceeds the ob-

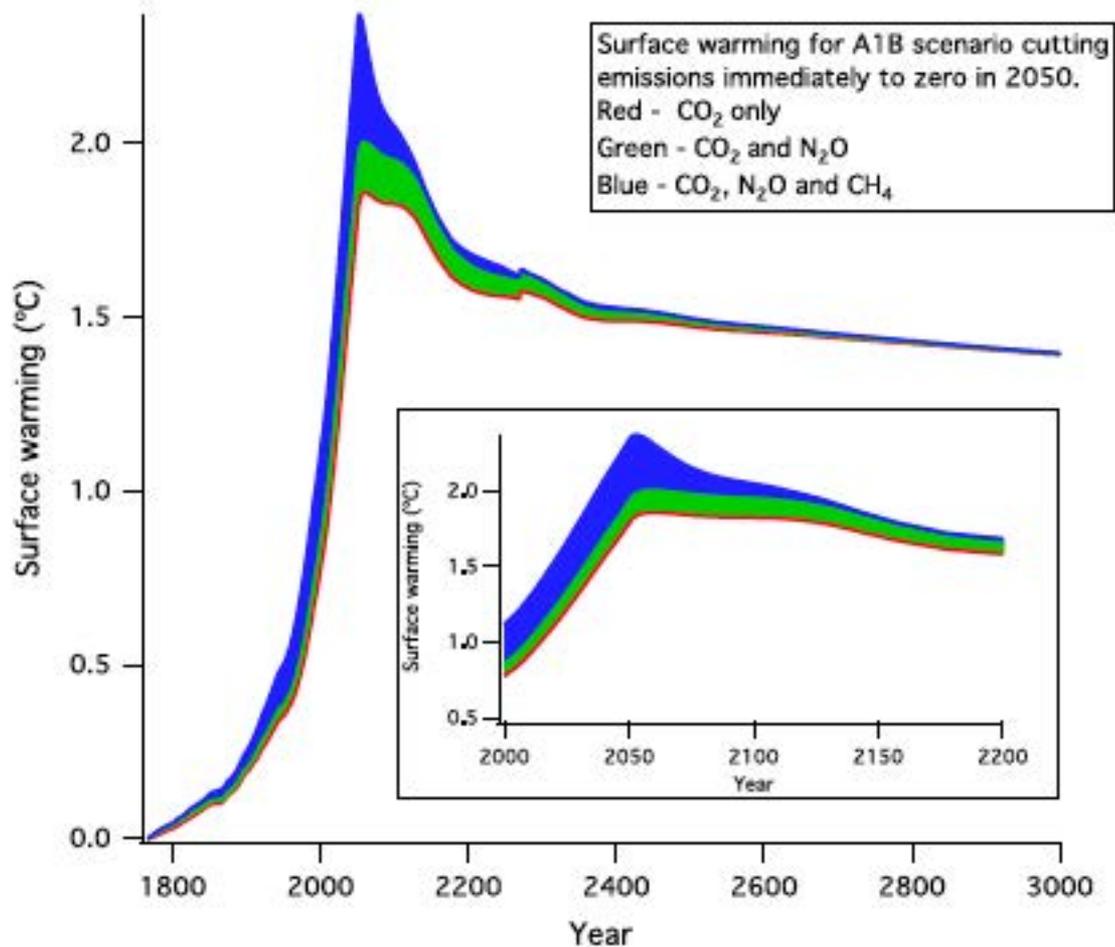


Fig. 1. Computed surface warming obtained in the Bern 2.5CC model due to CO₂, CH₄, and N₂O emission increases to 2050 following a “midrange” scenario (called A1B; see ref. 23) followed by zero anthropogenic emissions thereafter. The gases are changed sequentially in this calculation in order to explicitly separate the contributions of each. The bumps shown in the calculated warming are due to changes in ocean circulation, as in previous studies (5, 26, 39). The main panel shows the contributions to warming due to CO₂, N₂O, and CH₄. The inset shows an expanded view of the warming from year 2000 to 2200.

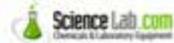
Climate, Health, Jobs at the UN Summit, 2014



Summary

- Climate change is impacting the health of workers and the general public now
- Workers are more highly exposed to climate-related hazards
 - Both climate impacts and climate “industry” impacts
- Occupational health community engagement needed for improving both climate resilience and climate mitigation





Science Lab.com
Chemicals & Laboratory Equipment



Material Safety Data Sheet Mineral oil MSDS

Section 1: Chemical Product and Company Identification

<p>Product Name: Mineral oil</p> <p>Catalog Code: 5231-027, 5231020</p> <p>CAS#: 8012-87-2 (9 gamma-Hexadecane)</p> <p>MSDS: Product Safety general (Preparation)</p> <p>Reg. #: TSCA: 801 (Inventory: Mineral oil)</p> <p>Oil: Not available</p> <p>Synonyms: Crude oil; 7-19 Hexadecane; Oil; Mineral Oil; NPL; White</p> <p>Chemical Name: Not available</p> <p>Chemical Formula: Not available</p>	<p>Contact Information:</p> <p>ScienceLab.com, Inc. 10000 South Ave. Houston, Texas 77050</p> <p>US Office: 1-800-800-8087 International Sales: 1-800-800-8080</p> <p>Order Online: www.sciencelab.com</p> <p>Emergency: 1-800-800-8087 International (24/7): 1-714-971-9887 International (24/7 FAX): 1-714-971-9887</p> <p>For non-emergency assistance: 1-800-800-8080</p>
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Section 2: Composition and Information on Ingredients

Ingredient	CAS #	% by Weight
Mineral oil	8012-87-2	100
	29800-00	
	8112-86-1	

Technological Data on Ingredients: Not available

Section 3: Hazard Identification

Potential Acute Health Effects:
Slightly toxic/inhale if vapor of high contact irritant; if ingestion: Non-toxic but oily. Non-irritant in case of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human); by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Reproductive or pregnancy exposure is not known to represent medical concern.

Section 4: First Aid Measures



Thank you!



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National Toxicology Program
U.S. Department of Health and Human Services



<http://www.niehs.nih.gov/geh>
<http://www.globalchange.gov/what-we-do/climate-change-health.html>

