

VALUING THE HEALTH COSTS OF OF CLIMATE CHANGE

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May 16, 2012

Climate Change: Mastering the Public Health Role

2011: A Year of Extremes

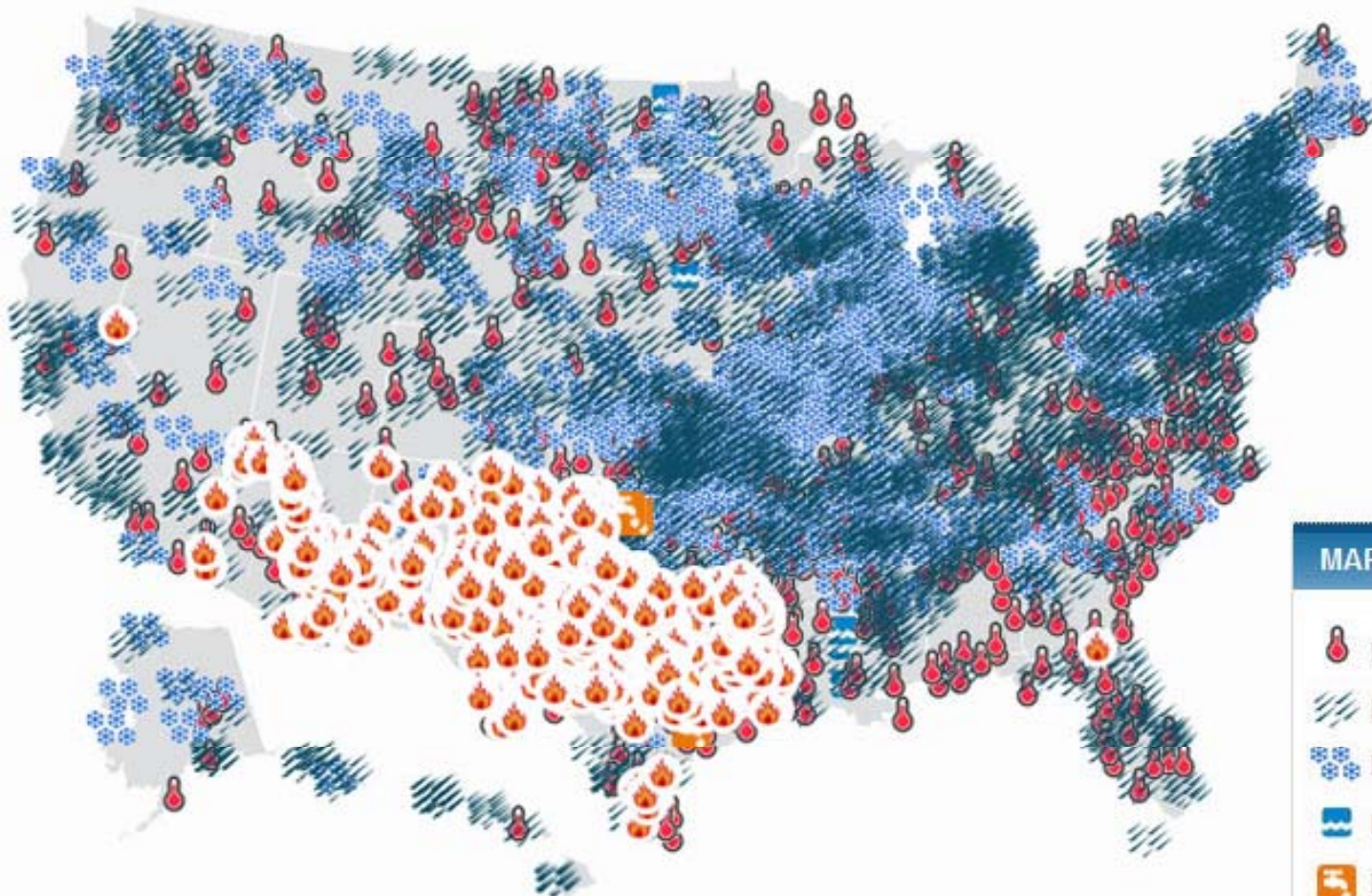
- 14 “billion-dollar” events: heat, drought, floods, snow, winds
- ***Estimated \$53 billion*** in damages
- Part of a trend:
 - 2000-2010: Warmest Decade on Record
 - 2010, 2005: hottest since 1880
 - 35 consecutive years with global temperatures $>20^{\text{th}}$ century average





Extreme Weather Map

2011: Thousands of Weather Records Broken in the US, Costs Climbing



NRDC's *Extreme Weather Map:*


- record-breaking weather in 2011
- climate change connections
- health costs avoidable via preparedness

MAP KEY

- Record Temperature
- Record Rainfall
- Record Snowfall
- Flooding
- Drought
- Wildfire

www.nrdc.org/extremeweather

Climate change threatens health



“Climate change is one of the most serious public health threats facing our nation. Yet few Americans are aware of the very real consequences of climate change on the health of our communities, our families and our children.”

- Dr. Georges Benjamin, Executive Director of the American Public Health Association

Connecting the Dots: Climate Change & Health

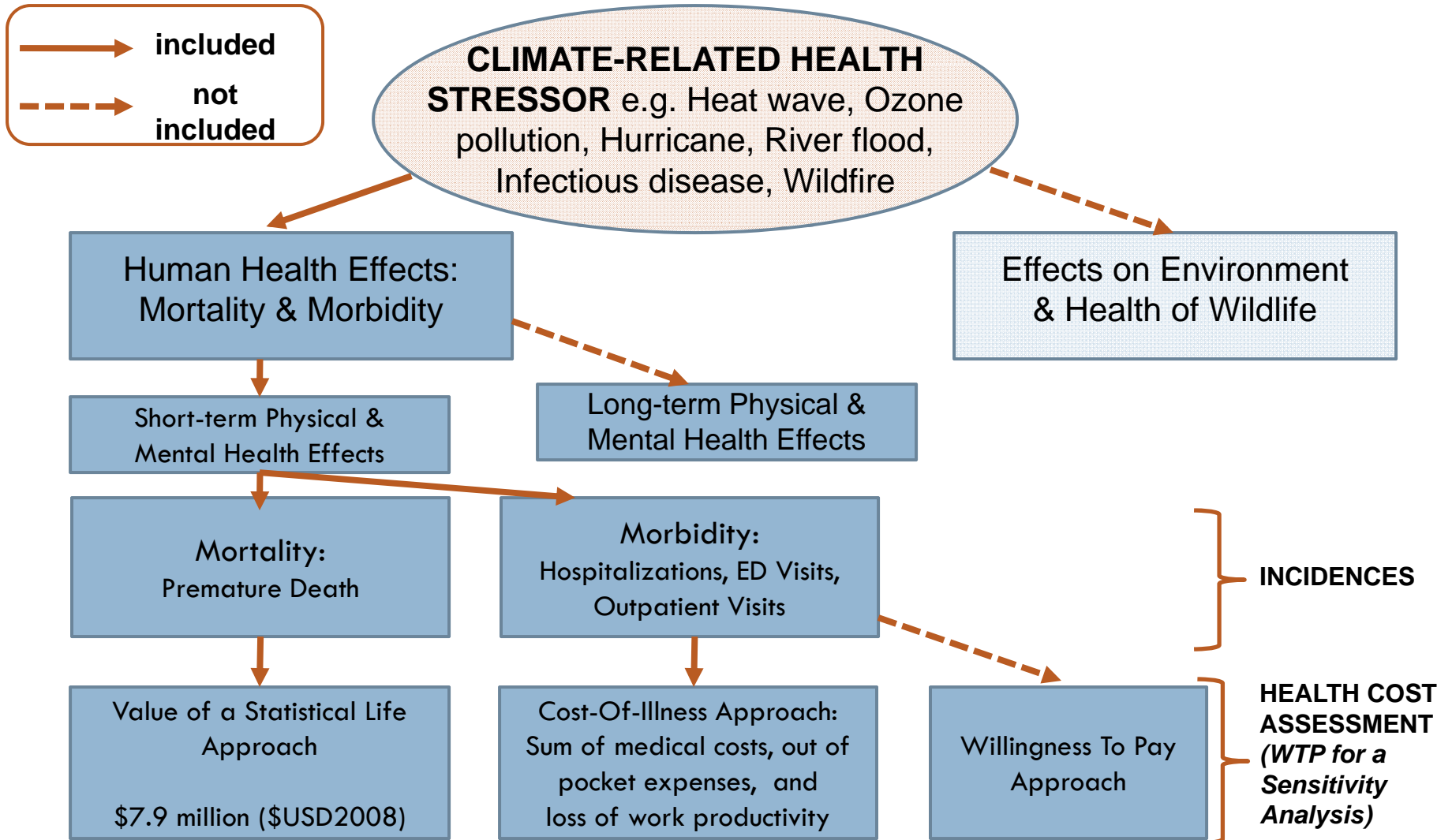


- Infrastructure damages previously the focus of climate change cost estimates
- **Health** damage costs have seldom been included
- Our method: Valuing *current* climate-sensitive event health costs via case studies, from event types expected to occur more frequently in future with climate change

US climate-health cost case studies

	Case Study Examined	
Climate – Sensitive Event Types	Scope	Dates
Ozone Air Pollution	National	2002
Heat Wave	California	2006
Hurricanes	Florida	2004
Infectious Disease	Louisiana (West Nile virus outbreak)	2002
River Flooding	Red River, North Dakota	2009
Wildfires	Southern California	2003

Health Cost Assessment



\$14 billion in health-related costs from just six US climate change-related events, 2002-2009 (Knowlton et al., *Health Affairs* 2011)

Six U.S. Case Studies, 2002-2009, Resulted in More Than \$14 Billion in Climate-Related Health Costs.

During the Red River and associated floods, two deaths, 263 emergency room visits, and an estimated 3,000 outpatient visits resulted in nearly \$20.4 million in health-related costs. Seasonal river flooding will increasingly affect many areas of the country, resulting in more injuries and deaths. Increased heavy downpours are projected from climate change as temperatures rise, raising levels of both evaporation and precipitation in many areas.



SMOG POLLUTION, NATIONWIDE, 2002

Across the U.S. in 2002, nearly 288 million Americans were exposed to ozone smog levels above the health-based standard, which was then 80 ppb. This exposure hastened death for 795 people, and caused 4,150 hospitalizations and more than 365,000 outpatient visits, at a cost of \$6.5 billion. Smog levels are anticipated to rise in the coming years, in the absence of strategies to reduce precursor emissions, because as climate change increases temperatures, ozone-forming chemical reactions also increase.

FLOODING, NORTH DAKOTA, 2009



FEMA News Photo



WEST NILE VIRUS, LOUISIANA, 2002

An outbreak of West Nile Virus in Louisiana in 2002 resulted in an estimated 24 premature deaths, 204 hospitalizations, and nearly 5,800 outpatient visits. Health-related costs totaled \$207 million. Mosquito-borne diseases are expected to emerge and spread into more northern climates as temperatures increase and create more habitable environments for mosquitoes.



FEMA News Photo

HURRICANES, FLORIDA, 2004

Four major hurricanes caused 144 premature deaths, nearly 2,200 hospitalizations, 2,600 emergency visits, and \$1.4 billion in health-related costs. Climate change is projected to increase the intensity of hurricanes, as sea surface temperature rise in the North Atlantic and provide more energy to drive storm systems. Some climate models project a doubling in the most intense hurricanes (Category 4 and 5) by late in this century.⁶

Over a two-week heat wave, 655 deaths, 1,620 hospitalizations, and more than 16,000 excess emergency room visits, resulted in nearly \$5.4 billion dollars in costs. Major heat waves such as this are expected to occur more frequently in the future.

HEAT WAVE, CALIFORNIA, 2006



WILDFIRES, SOUTHERN CALIFORNIA, 2003

These fires burned more than 736,000 acres and resulted in 69 deaths, 778 hospitalizations, and more than 47,600 outpatient visits. Together, this resulted in health-related costs exceeding \$578 million. Conditions conducive to wildfires, including drought and extreme heat, are expected to worsen in many parts of the country due to climate change.



© Dave Powell, USDA Forest Service

Table 1. Health costs in climate change-related case study areas, with costs per health effect, 2002 through 2009.

Climate Change-Related Case Study	Premature Death	Illness	Total Health Cost by Case Study
Ozone smog pollution	\$6.3 Billion	\$254 Million	\$6.5 Billion
Heat wave	\$5.2 Billion	\$179 Million	\$5.3 Billion
Hurricane	\$1.1 Billion	\$255 Million	\$1.4 Billion
Wildfire	\$545 Million	\$34 Million	\$578 Million
Mosquito-borne infectious disease	\$190 Million	\$18 Million	\$207 Million
River flooding	\$16 Million	\$5 Million	\$20 Million
Total costs (in U.S. dollars, 2008)	\$13.3 Billion	\$744 Million	\$14.1 Billion



<http://www.nrdc.org/health/accountingforcosts/>

Challenges in estimating health costs

- ❑ Lack of access to basic surveillance and morbidity data at consistent national scale
- ❑ No uniform method of assigning costs to different health effects from different events, regions
- ❑ Attribution: was event's occurrence (intensity, frequency, extent/duration) affected by climate change?
- ❑ The Big Challenge:

Half-dozen current case studies



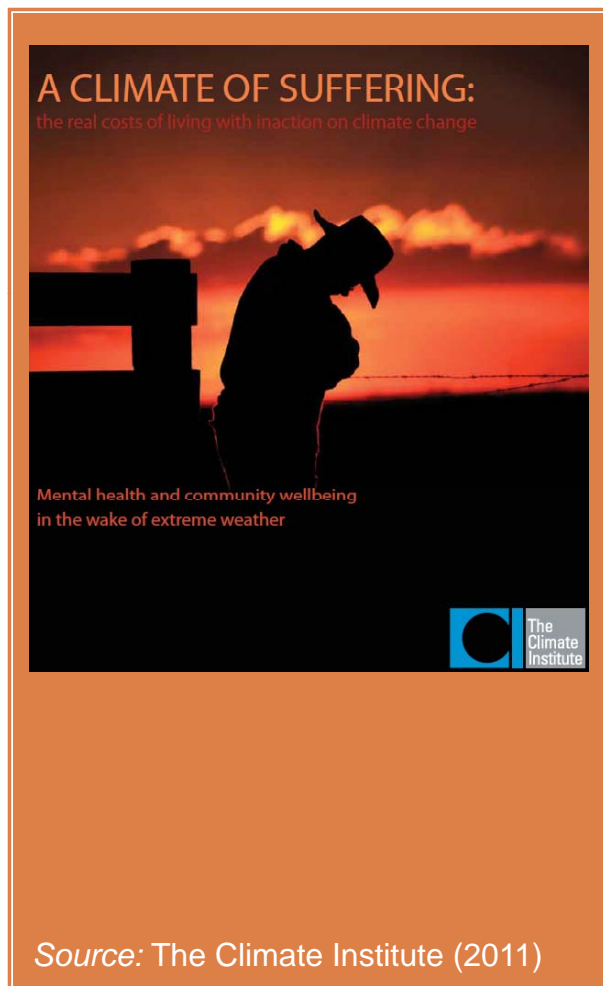
Hundreds of events in future

Climate-Health Impacts

- **Extreme Storm Events**
- **Heat Waves**
- **Air Pollution**
- **Pollens and Allergy**
- **Water-borne Diseases**
- **Food-borne Diseases**
- **Vector-Borne Diseases**
- **Ecosystem Impacts**
- **Food & Water Supply Insecurity**
- **Mental Health Impacts**
- **Environmental Refugees**



Other climate-related costs



- More climate-health effects to value
 - ▣ Other vector-borne diseases
 - ▣ Waterborne illnesses
 - ▣ Allergies
 - ▣ Mental health
 - ▣ Food insecurity
- Insurance
 - ▣ Travelers - illnesses contracted in US
 - ▣ Farmers - crop insurance
 - ▣ Homeowners- flood insurance
 - ▣ Businesses – liability insurance
- Preparedness costs
 - ▣ Will likely bring net benefits

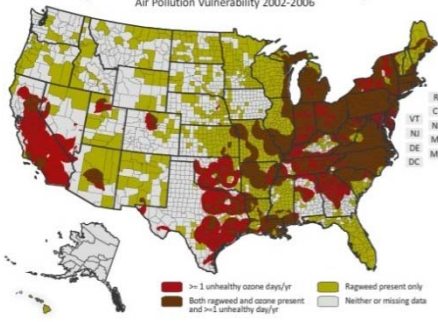


CLIMATE CHANGE THREATENS HEALTH

SERIOUS THREATS WHERE YOU LIVE AND WHAT TO DO ABOUT THEM

Climate change is one of the most serious public health threats facing the nation, but few people are aware of how it can affect them. Children, the elderly, and communities living in poverty are among the most vulnerable. Click on a state on the map for more information on climate-health threats, actions being taken to prepare communities, and what you can do.

PREVIOUS MAP Ozone Smog and Allergenic Ragweed Air Pollution Vulnerability 2002-2006 NEXT MAP



Pick a state: Or enter your zip code: Go!

Five Ways Climate Change Threatens Health

Air Pollution »
Rising heat worsens smog. Burning coal and oil emits carbon and particle pollution; plants produce more allergenic pollen, affecting respiratory health threats like asthma. Find out more »

Extreme Heat »
Heat waves send thousands to emergency rooms and cost health care systems millions of dollars; climate change brings longer, more intense heat waves. Find out more »

Infectious Diseases »
Hotter summers can make disease-carrying insects more active, for longer seasons; illnesses like dengue, West Nile, and Lyme can spread into new areas. Find out more »

Drought »
Hotter days and nights, and changing rainfall patterns reduce water supply quantity and quality, and diminish food security. Find out more »

Flooding »
Climate change intensifies rainfall, heavy rains increase risk of drinking water contamination and illness; floods can force communities to relocate. Find out more »

MORE INFORMATION

Take Action



VIDEO: Climate Change Threatens Health



Watch the Video »

Issue Papers and Reports

- **Climate and Your Health** (2011)
Addressing the Most Serious Health Effects of Climate Change
- **Climate Change, Water, and Risk** (2010)
Current Water Demands Are Not Sustainable
- **Tides of Trouble** (2010)
Increased Threats to Human Health and Ecosystems from Harmful Algal Blooms
- **The Worst Summer Ever?** (2010)
A report on record setting night-time temperatures
- **Fever Pitch** (2009)
Mosquito-Borne Dengue Fever Threat Spreading in the Americas
- **Boosting the Benefits** (2008)
Improving Air Quality and Health by Reducing Global Warming Pollution in California
- **Preparing for Global Warming** (2008)
A Framework for Protecting Community Health and the Environment in a Warmer World
- **Sneezing and Wheezing** (2007)
How Global Warming Could Increase Ragweed Allergies, Air Pollution and Asthma

Climate and Health blog posts from

SWITCHBOARD

Dirty, Stinky Summer Air Reminds Us Why We Need Stricter Air Quality Standards that Cut Pollution
posted by Kim Knowlton, 8/30/11
Today it was 111°F in Phoenix, AZ; tomorrow a high of 107°F is predicted. More than 70 ...

Waiting for Irene and Remembering Katrina
posted by Gina Solomon, 8/25/11
Like most people on the East Coast, I'm anxiously watching the approach of Hurricane Irene, a ...

Irene Approaches, But Climate Change Got Here First!
posted by Kim Knowlton, 8/25/11
NRDC's "Climate Change Threatens Health" webpages map five major climate-health ...

Strengthening Local Level Heat-Health Measures in India
posted by Anjali Jaswal, 8/17/11
NRDC's new tool, "Climate Change Threatens Health" shows local data and maps detailing extreme ...

More from Switchboard >>

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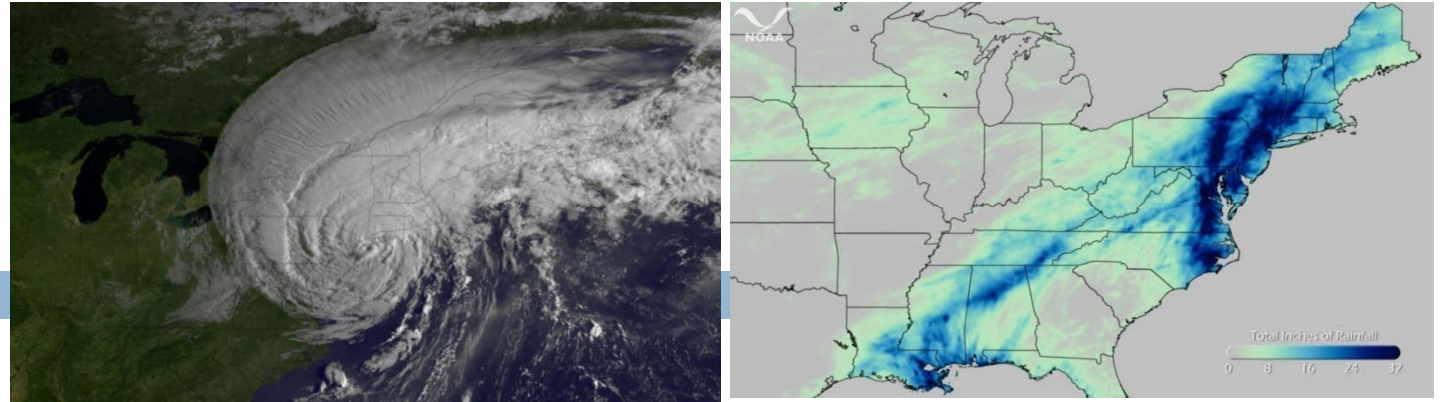
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NRDC's
Climate Change Threatens Health
website:
local climate-health threats, and adaptation actions

www.nrdc.org/climatemaps



Source: NOAA

□ Two Strategies for Climate Solutions

Mitigation

interventions to reduce emissions of carbon pollution

Adaptation

measures to reduce the vulnerability of natural & human systems against climate change's effects

EPA's Proposed Power Plant Rule

- ❑ US Environmental Protection Agency (EPA) has proposed first national limits on carbon pollution from new power plants
- ❑ Sets emission rate standard for new power plants
- ❑ In proposing new safeguards, EPA is following the Clean Air Act and two Supreme Court decisions.



4 Key Elements of Adaptation: Climate-Health Preparedness Strategies

- Identify Local Vulnerabilities
- Track Environmental Changes & Health Threats
- Build Resilient Communities
- Promote Education & Public Dialogue



Example: Heat-Health Warning Systems



HEAT WATCH/WARNING SYSTEMS SAVE LIVES

Estimated Costs and Benefits for Philadelphia 1995–98

BY KRISTIE L. EBI, THOMAS J. TEISBERG, LAURENCE S. KALKSTEIN,
LAWRENCE ROBINSON, AND RODNEY F. WEIHER

The cost of running a heat wave warning system for Philadelphia were practically at the "noise" level compared to the economic benefits of saving 117 lives in three years.

Ebi et al. (BAMS 2004)



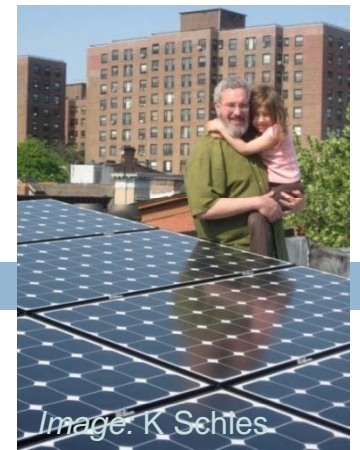
- **Identifying Vulnerabilities** - City worked w/agencies to identify where elders live; Neighbors check on elderly via "buddy system" in heatwaves
- **Tracking** - National Weather Service, Dept of Public Health, Corporation for Aging, News Media are in contact when heat wave is predicted, and public is alerted frequently; free "Hotline" info
- **Climate-Smart Design** Cool Homes Program encourages energy-efficient design; free energy audits
- **Public Education** Cooling centers opened; no utility service suspensions; more Fire, EMS, Homeless svc staff; Public education about protecting health, getting info during heat wave

Future Directions in Valuing Health



- ***Better Climate Cost Analyses*** - including health costs as key economic damages.
 - ***Scientific Consensus on Valuation Methods***
 - ***Greater Focus on Morbidity Analyses***
 - ***Improved Tracking*** - monitor climate-sensitive health outcomes & environmental indicators related to climate change
- ***More Support for Preparedness in Communities***
- ***Limit Climate Change***

Conclusions



- Climate change harms health
- Action is needed to reduce carbon pollution & limit its most severe health effects
- We can create healthier, more secure communities by preparing for climate change's effects on health





Record Heat

Record Storms

I WONDER IF THIS IS GOD PUNISHING US FOR NOT PASSING A CLIMATE BILL.

NO, IT'S US PUNISHING OURSELVES.

T.S.

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PEOPLE WORK IN MYSTERIOUS WAYS. -

L.P.

“We know enough now to act”



Thank you

kknowlton@nrdc.org

www.nrdc.org/climatemaps

Link to health costs of climate change paper in Health Affairs at:

<http://www.nrdc.org/health/accountingforcosts/>