Environmental Exposure, Environmental Justice, and Climate Change,

A collaborative partnership with a community in Indianapolis, Indiana

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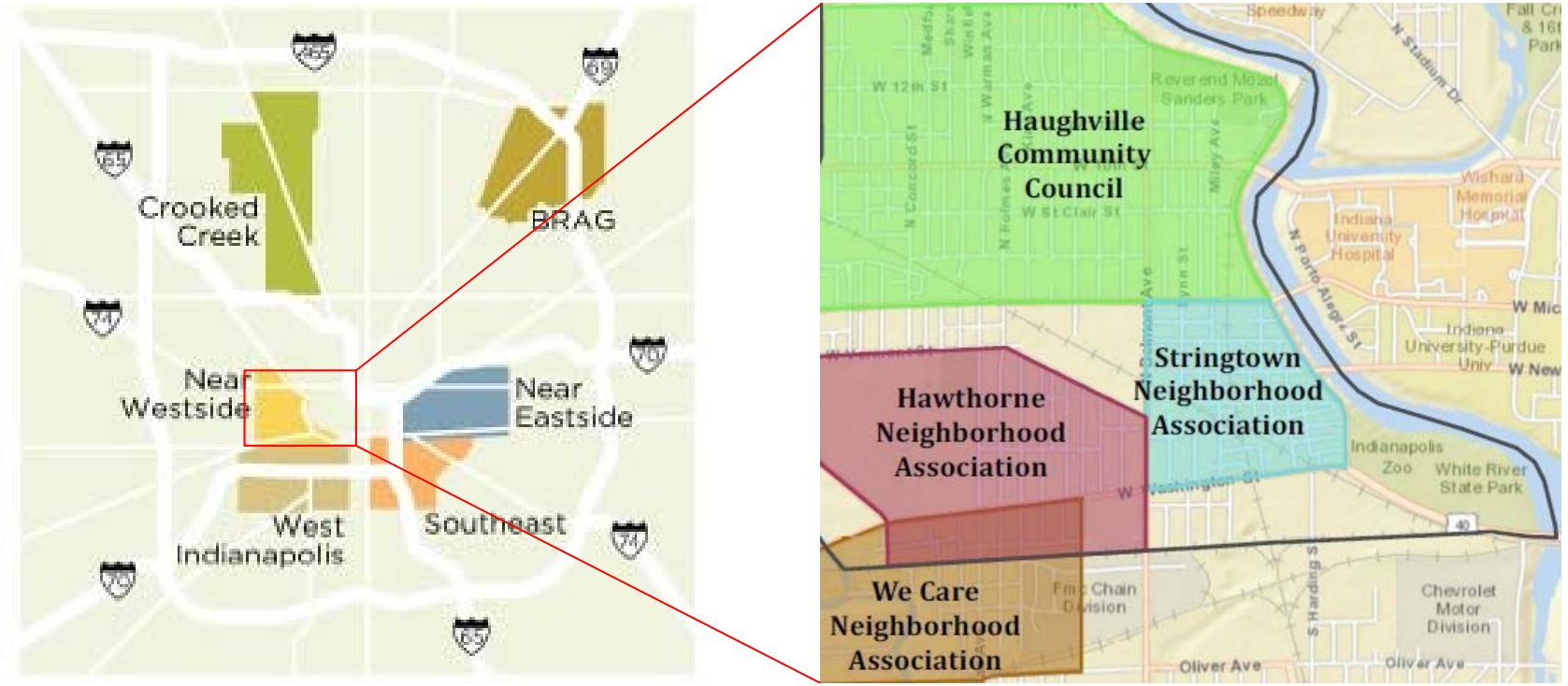
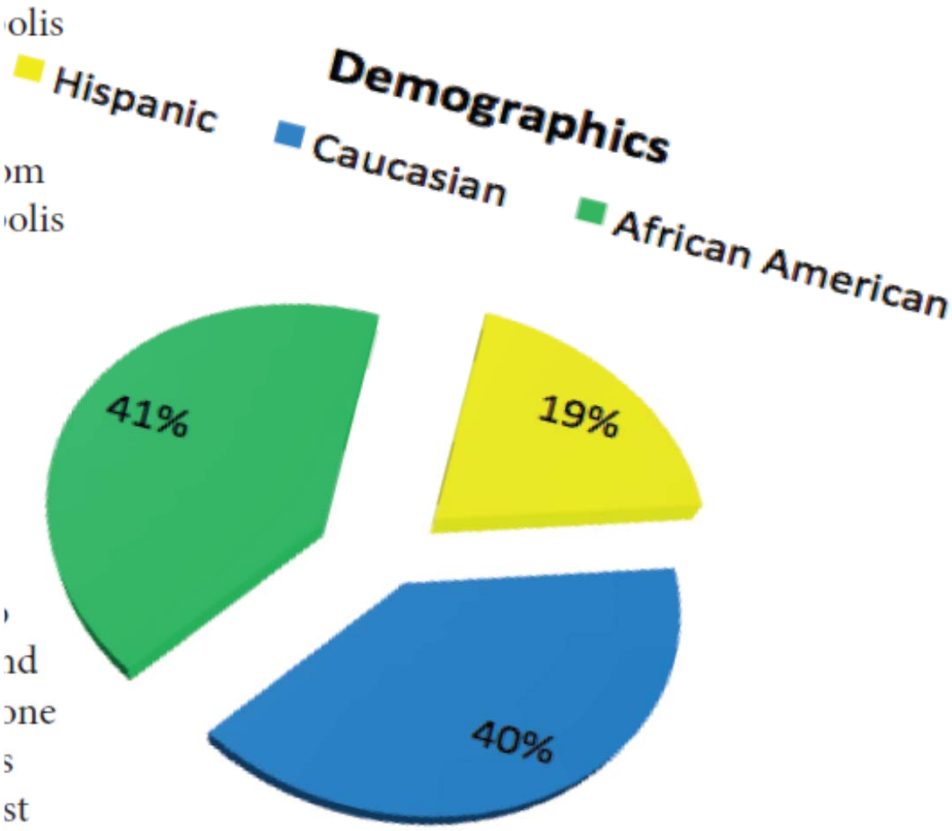
Healthy Environment and Community Assessment Partnership

- Near West Community of Indianapolis, IN



- Working class community



WESCO Quality of Life Plan 2015-2017

Two projects under this partnership

- Project #1: Multi-layer Data Community Action Tool (MDCAT)
  - Supported by US EPA, Society of Chemical Hazard Communication
  - To assess vulnerabilities from environmental burden
  - To inform cleanup prioritization, intervention and cost-benefit evaluation
  - Replicable &scalable to other locations in the US (standard manual available, all publicly available data etc)
  - For both policymakers and community

Academic Partners, Supported by US EPA TRI

Society for Chemical Hazard Communication

Society for Chemical Hazard Communication

United States Environmental Protection Agency

Toxics Release Inventory (TRI) Program

2015-2016 TRI University Challenge Academic Partners

We received outstanding applications from eight colleges and universities in response to the 2015 TRI University Challenge, and we'll be working with three of these academic partners for the 2015-2016 academic year.

Descriptions of each of the project proposals are below. Please note that expected project outcomes may change. As the projects continue throughout the school year, we will provide progress updates and post deliverables.

Indiana University-Purdue University-Indianapolis – IU Fairbanks School of Public Health

Primary Researcher:

- Dr. Yi Wang, Associate Professor of Environmental Health Sciences

Expected Project Outcomes:

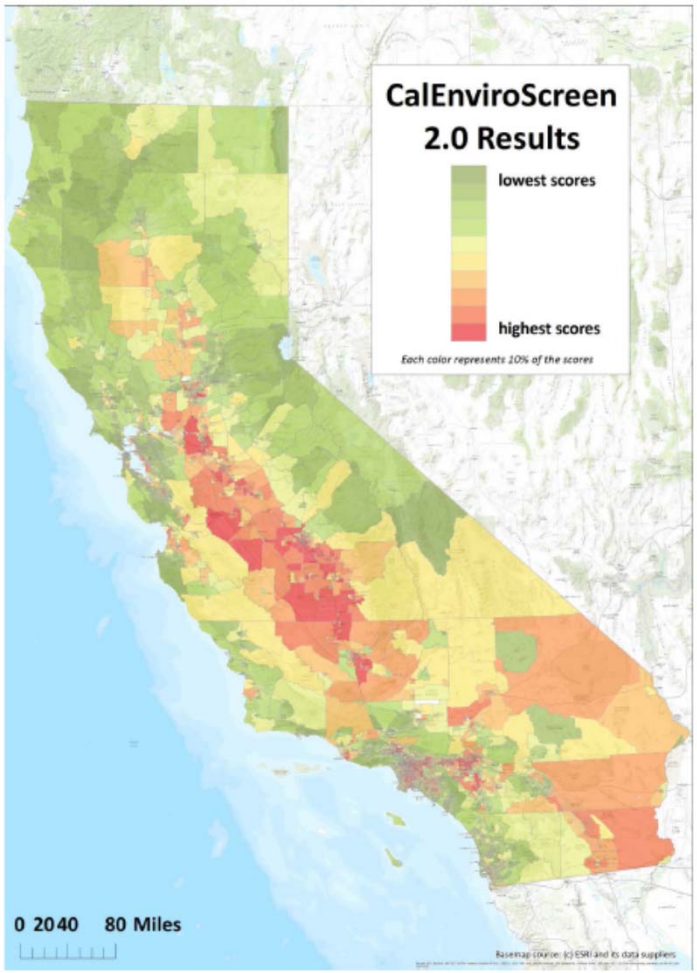
- Develop the Multi-layer Data Community Action Tool (MDCAT) web portal
- Increase information sharing and enhancement of environmental and public health initiatives
- Demonstrate how environmental data can empower communities

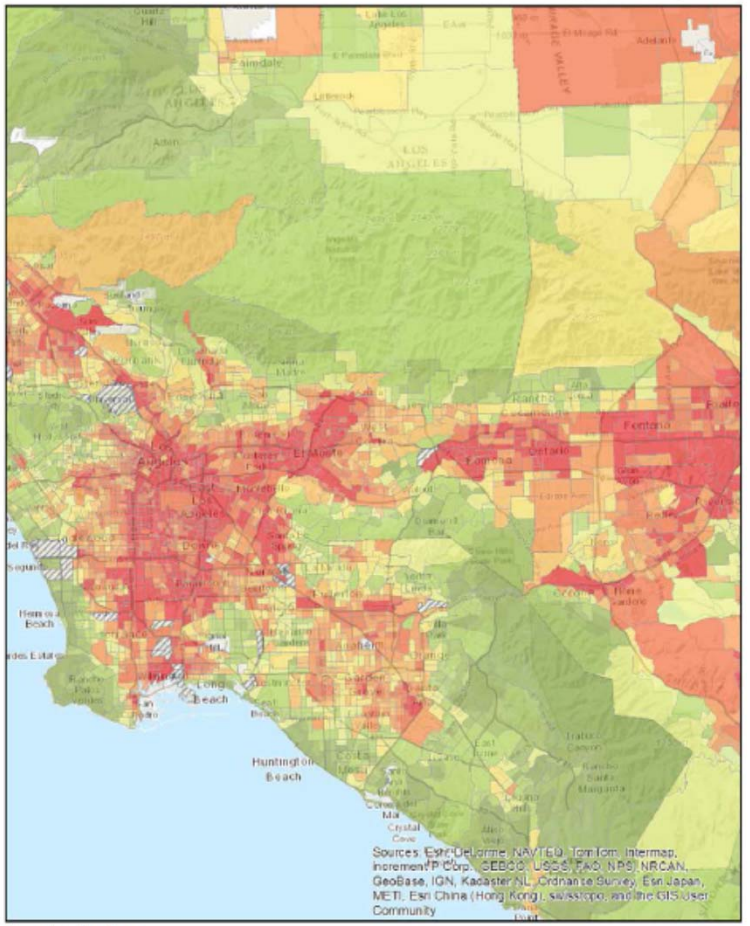
In a minute…

Project #2: Effects of Climate Change on Environmental Exposures

Vulnerable Populations

- Populations can be vulnerable for a number of reasons:
  - Geography (Proximity)
  - Biological (Children, elderly, pregnant women, those with chronic diseases)
  - Lack of social capital (access to health care, economic barriers)
  - Accumulation of effects

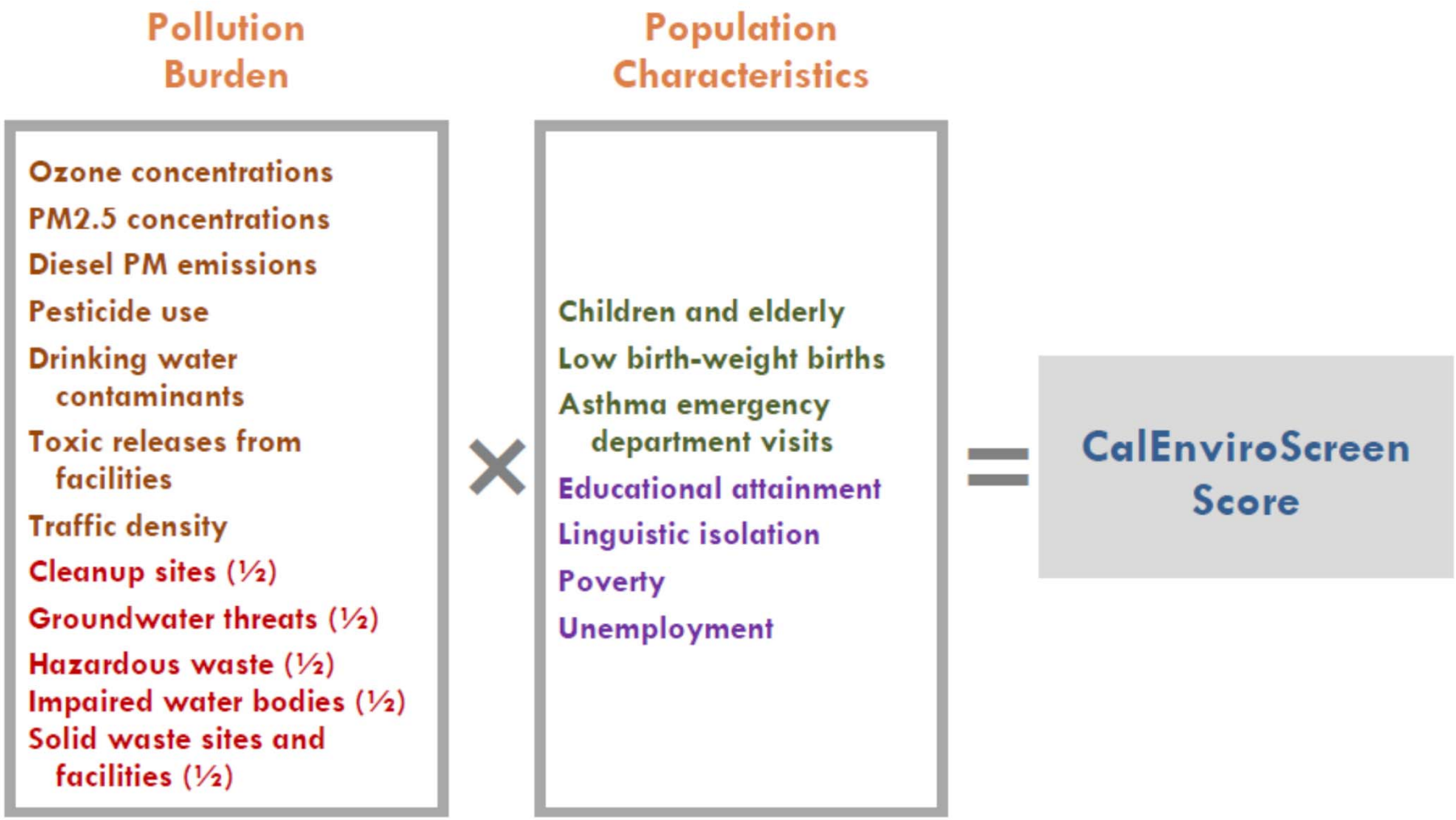




Los Angeles Area

0 5 10 20 Miles

map source: (c) ESRI and its data suppliers


Pollution Burden
Ozone concentrations
PM2.5 concentrations
Diesel PM emissions
Pesticide use
Drinking water contaminants
Toxic releases from facilities
Traffic density
Cleanup sites (½)
Groundwater threats (½)
Hazardous waste (½)
Impaired water bodies (½)
Solid waste sites and facilities (½)
×
Population Characteristics
Children and elderly
Low birth-weight births
Asthma emergency department visits
Educational attainment
Linguistic isolation
Poverty
Unemployment
=
CalEnviroScreen Score

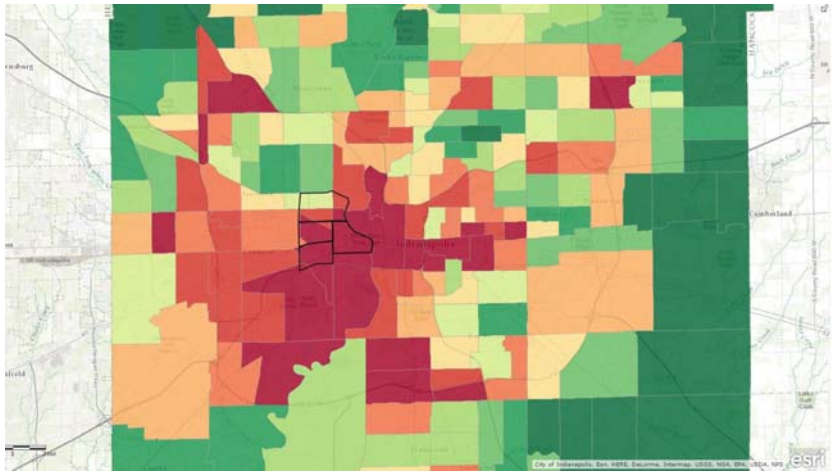
MDCAT

Multi-Layer Data Community Action Tool

- 15 individual indicators as well as a composite cumulative MDCAT score.
- Scores are provided for each census tract in Marion County and scored as a percentile.

Environmental Justice in Marion County

- Social indicator maps show:
  - Educational attainment
  - Linguistic isolation
  - Poverty
- Pollution indicator maps show:
  - PM 2.5
  - Groundwater threats
  - Toxic release from facilities
  - Cleanup sites
  - Hazardous waste sites
- These indicators have cumulative effects, as seen in Near West Indy



Community Action Manuals for Community Members

- Community Maps (storytelling on one page)
- Infographics for
  - Air Pollution
  - Water Pollution
  - Remediation/Toxic Release Sites
  - Social Vulnerabilities

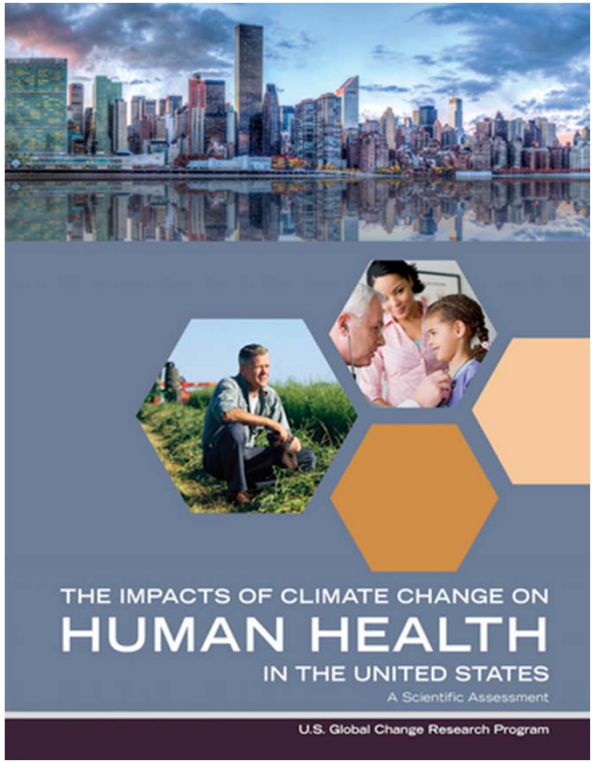
Potential Application

- Project #1: Multi-layer Data Community Action Tool (MDCAT)
  - To assess vulnerabilities from environmental burden
  - To inform cleanup prioritization, intervention and cost-benefit evaluation
  - Replicable &scalable to other locations in the US (standard manual available, all publicly available data etc)
  - For both policymakers and community

Project #2: Interaction of Climate Change and Environmental Exposure

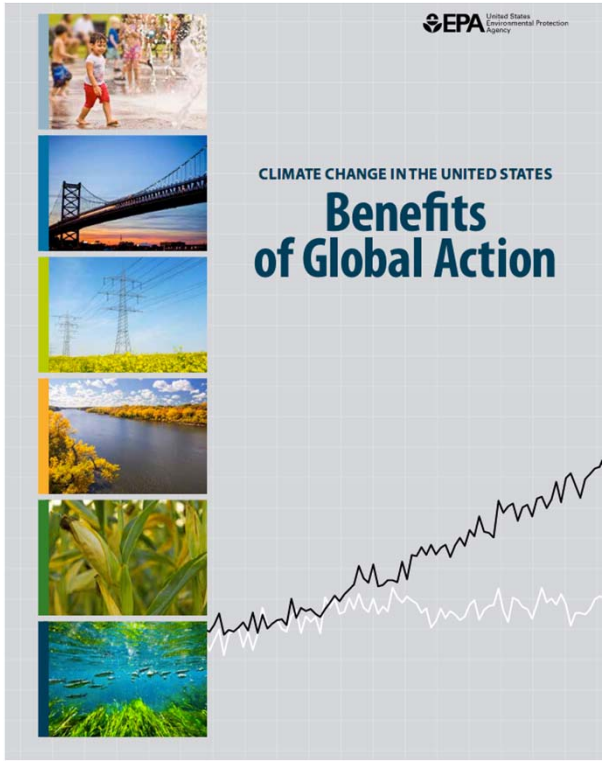
Climate Change and Human Health

April 2016



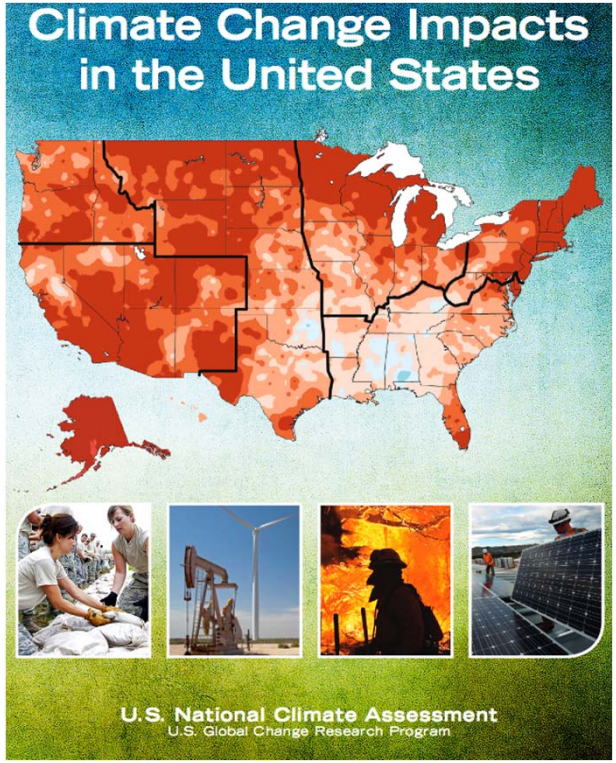
http://www.globalchange.gov/health-assessment

June 2015

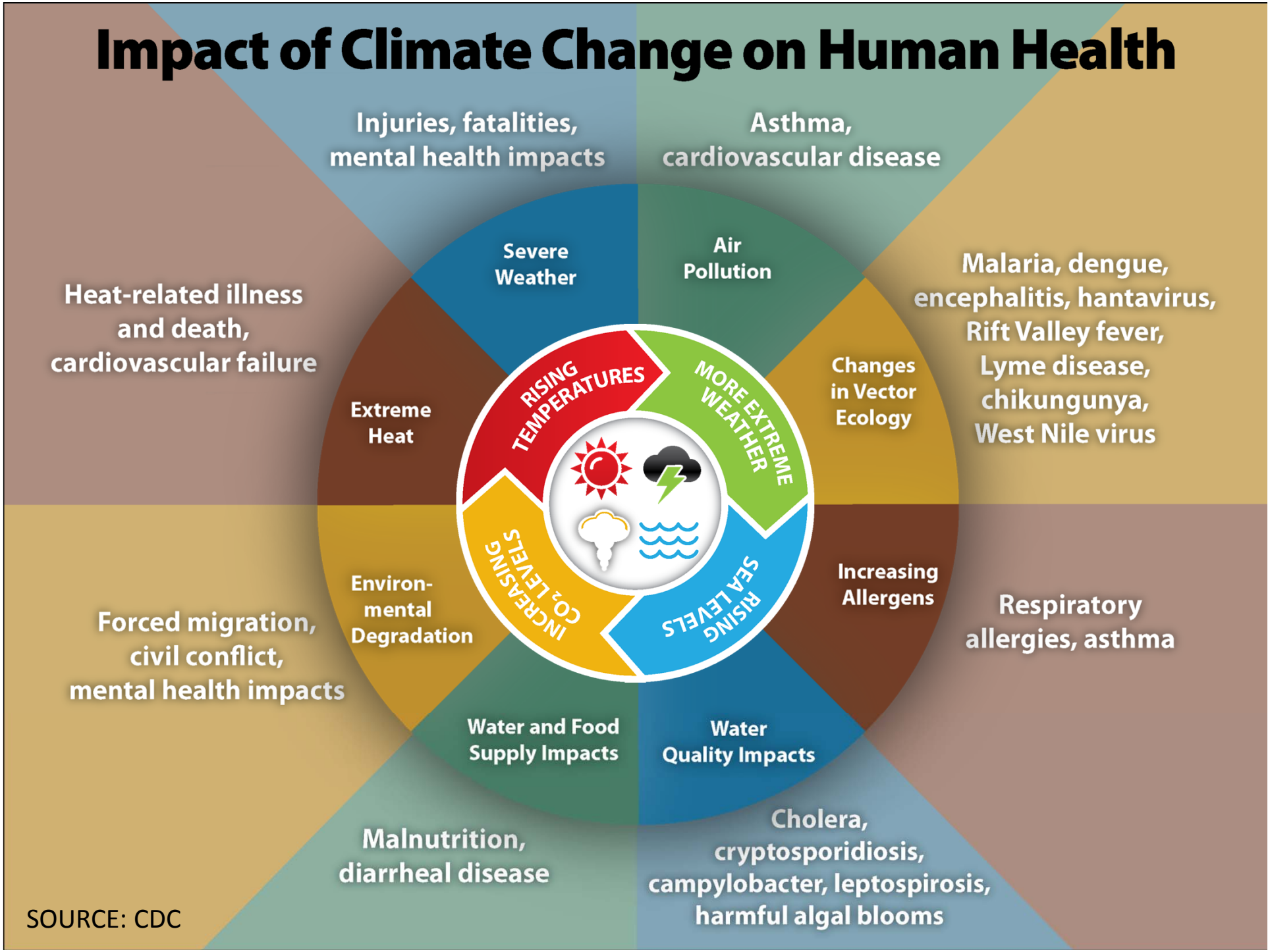


https://www.epa.gov/cira/downloads-cira-report

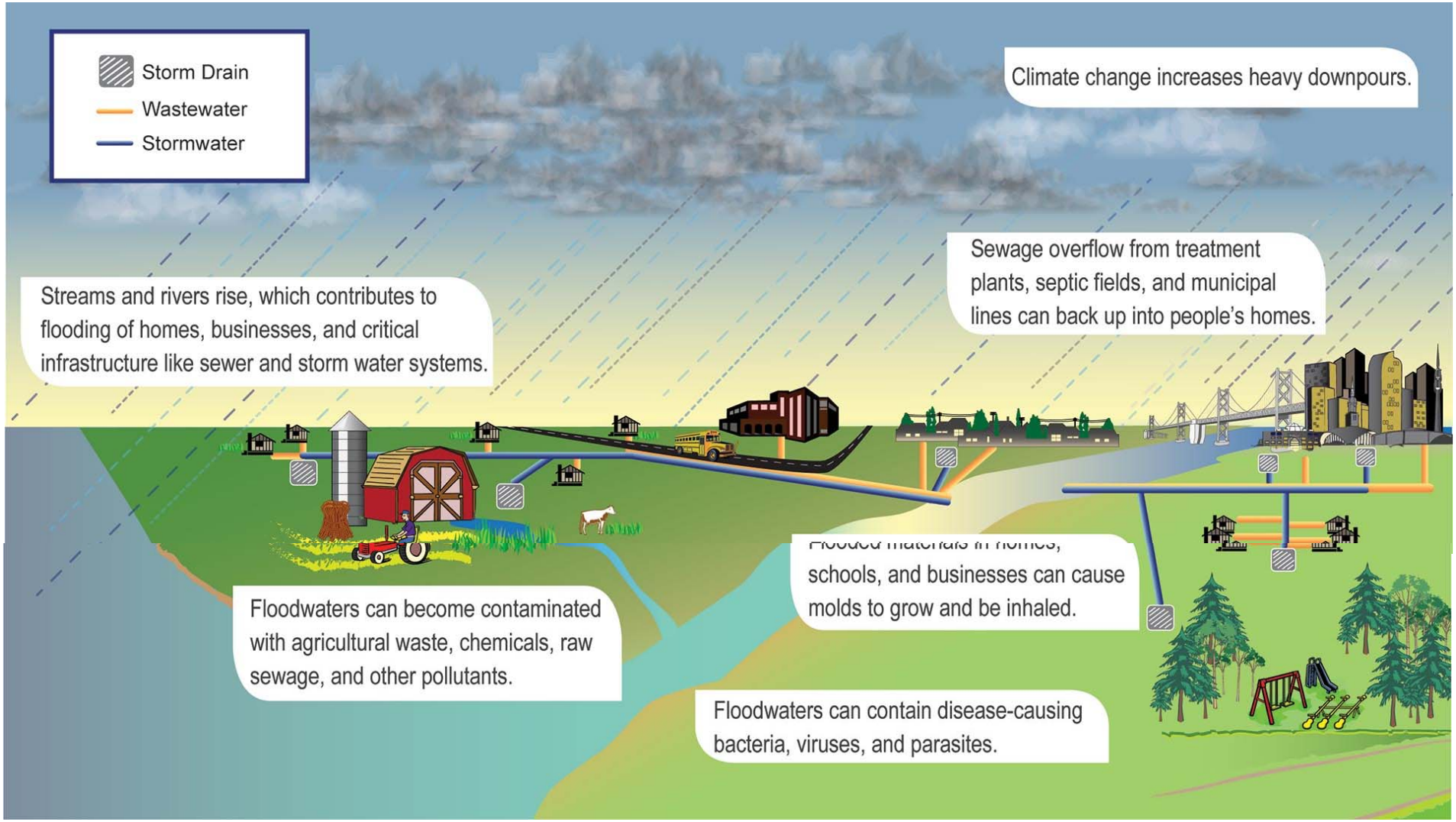
May 2014



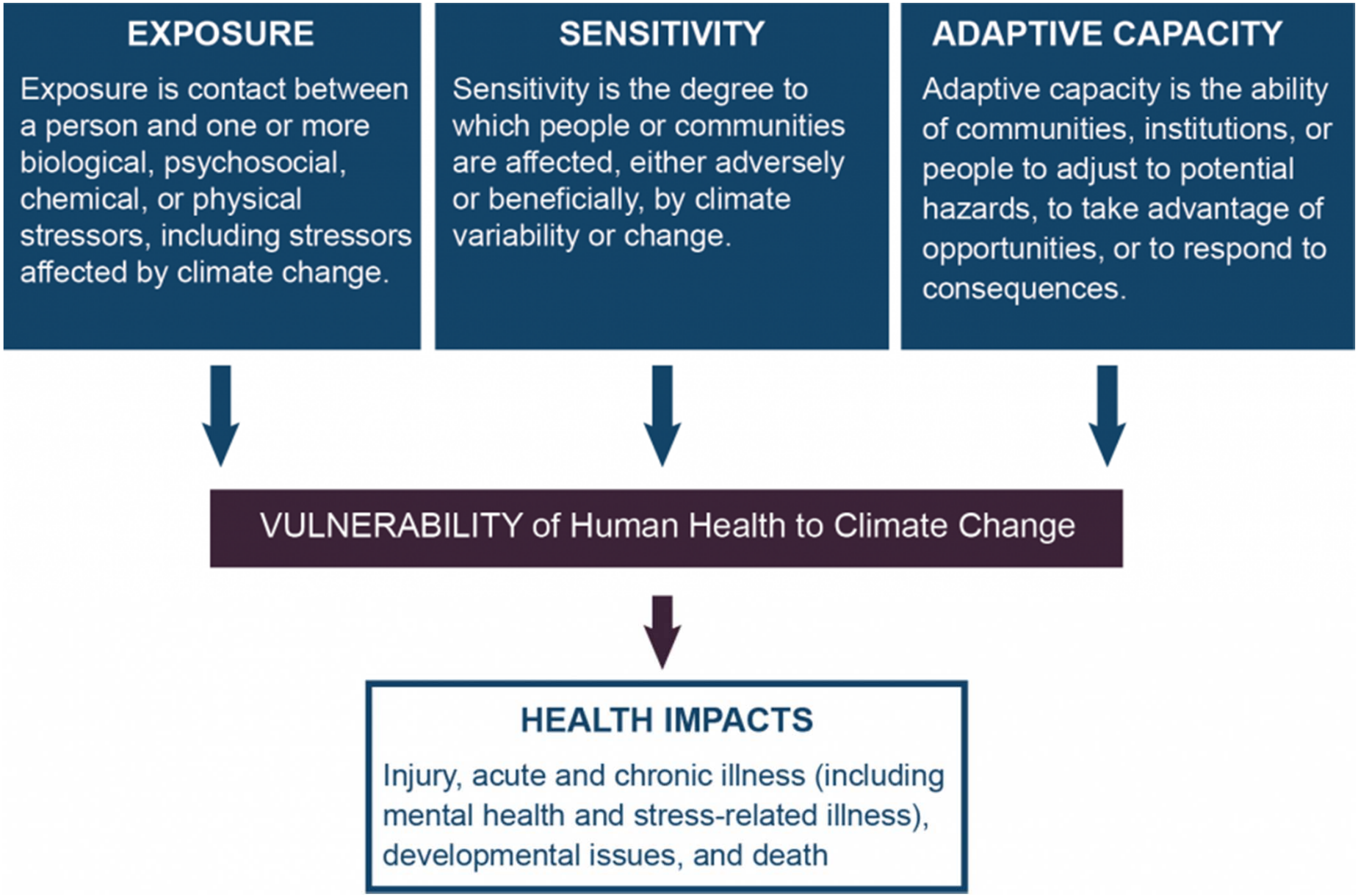
http://nca2014.globalchange.gov/


Impact of Climate Change on Human Health
Injuries, fatalities, mental health impacts
Asthma, cardiovascular disease
Heat-related illness and death, cardiovascular failure
Malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, West Nile virus
Forced migration, civil conflict, mental health impacts
Respiratory allergies, asthma
Malnutrition, diarrheal disease
Cholera, cryptosporidiosis, campylobacter, leptospirosis, harmful algal blooms
Severe Weather
Air Pollution
Extreme Heat
Changes in Vector Ecology
Environ-mental Degradation
Increasing Allergens
Water and Food Supply Impacts
Water Quality Impacts
RISING TEMPERATURES
MORE EXTREME WEATHER
INCREASING CO2 LEVELS
RISING SEA LEVELS
SOURCE: CDC

Precipitation and Health



National Climate Assessment 2014

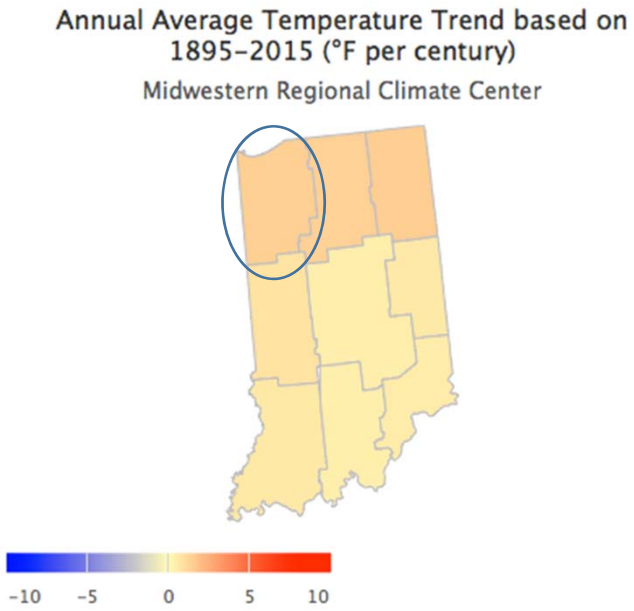


Source: Climate and Health Assessment, 2016

Climate change is already happening!

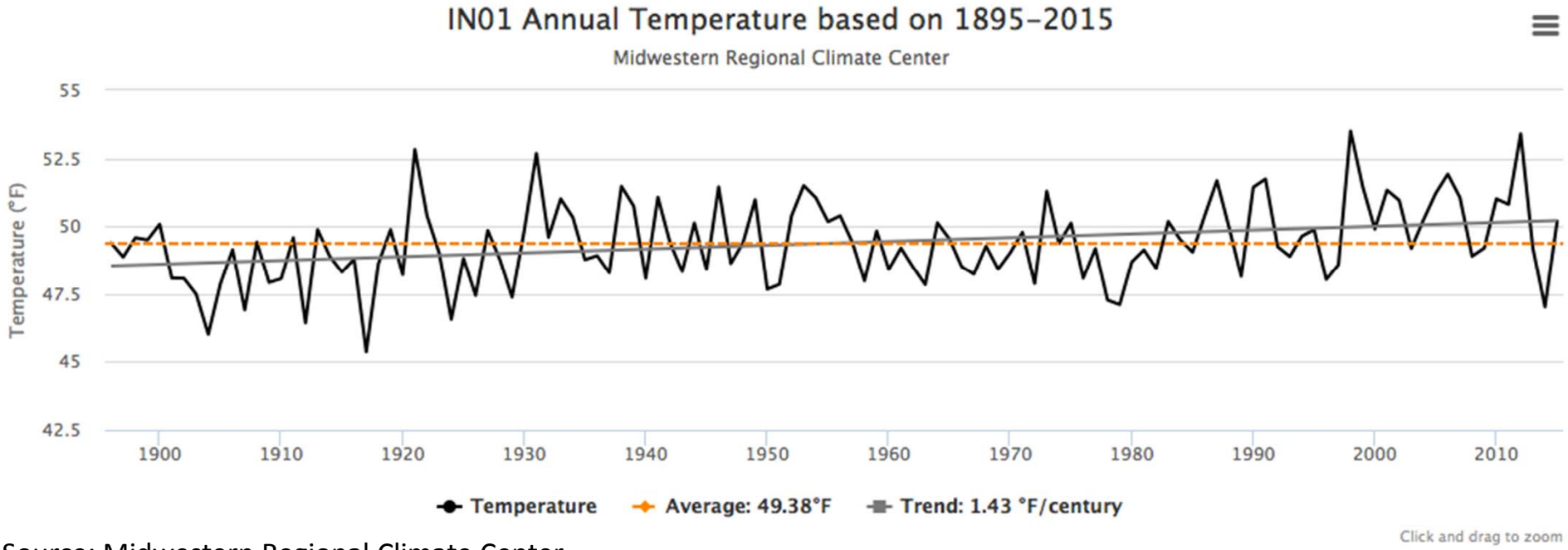
Indiana has gotten warmer and wetter over the past century or so…

…with more of its precipitation coming in a few big events



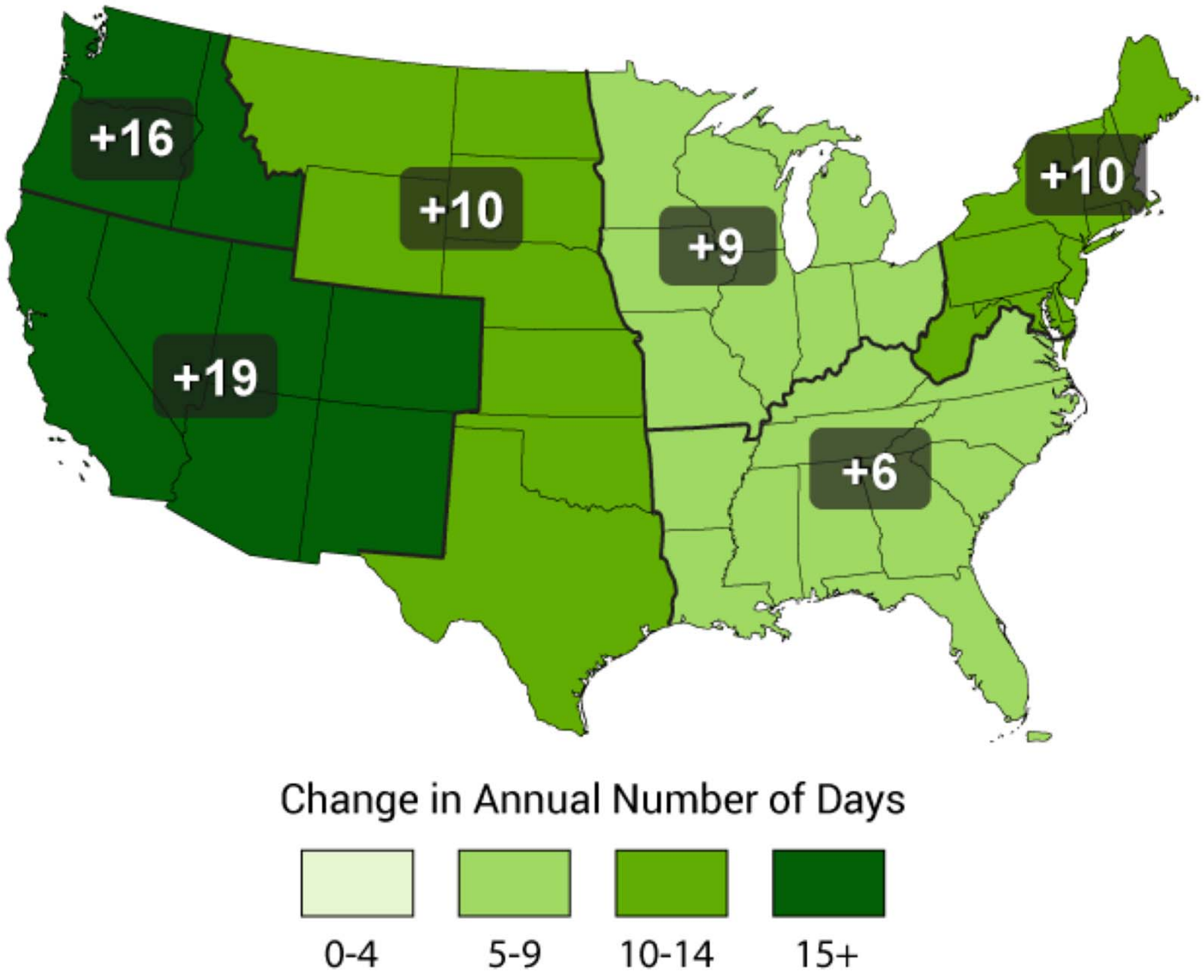
Observations for IN01 (northwest Indiana)

- Min temps <u>increasing</u> in all seasons (2.34-2.77 ºF) and annually (2.65 ºF)
- Max temps decreasing in summer (-1.48 ºF); increasing in spring (1.42 ºF)& winter (0.55 ºF); no change in fall



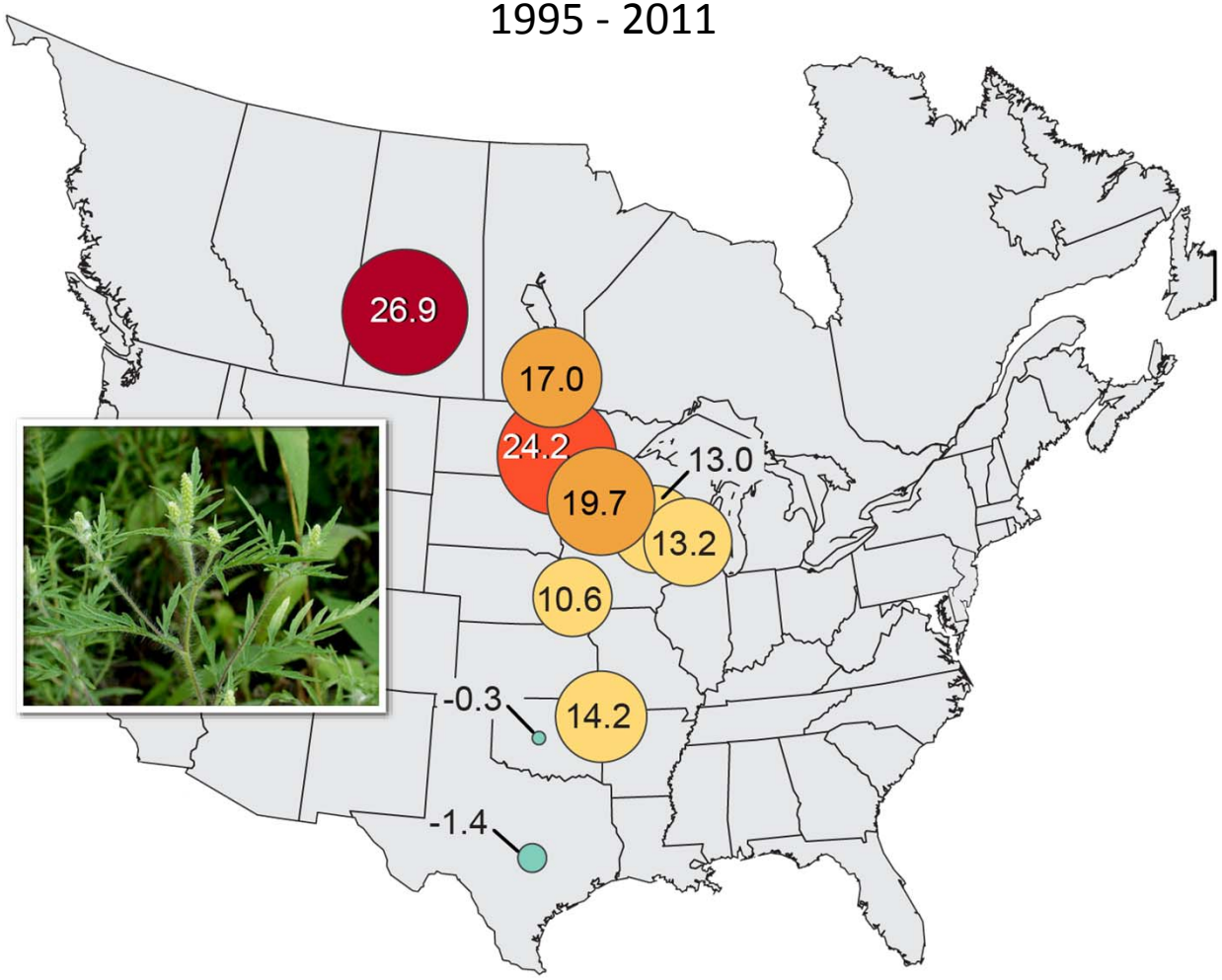
Source: Midwestern Regional Climate Center

Observed changes in the annual number of frost-free days
(1991-2012 relative to 1901-1960)



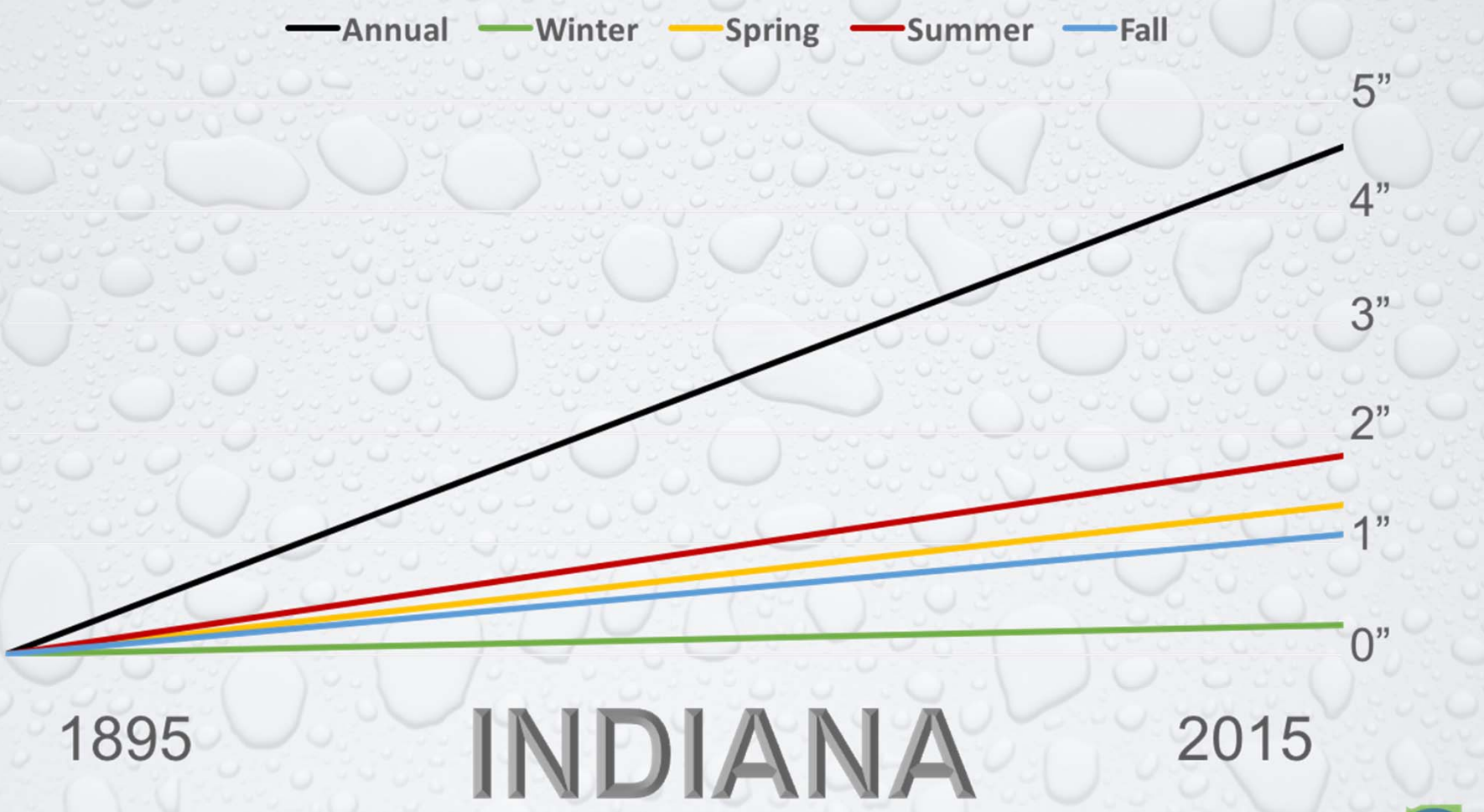
Ragweed Pollen Season Lengthens

1995 - 2011



Source: 2014 National Climate Assessment

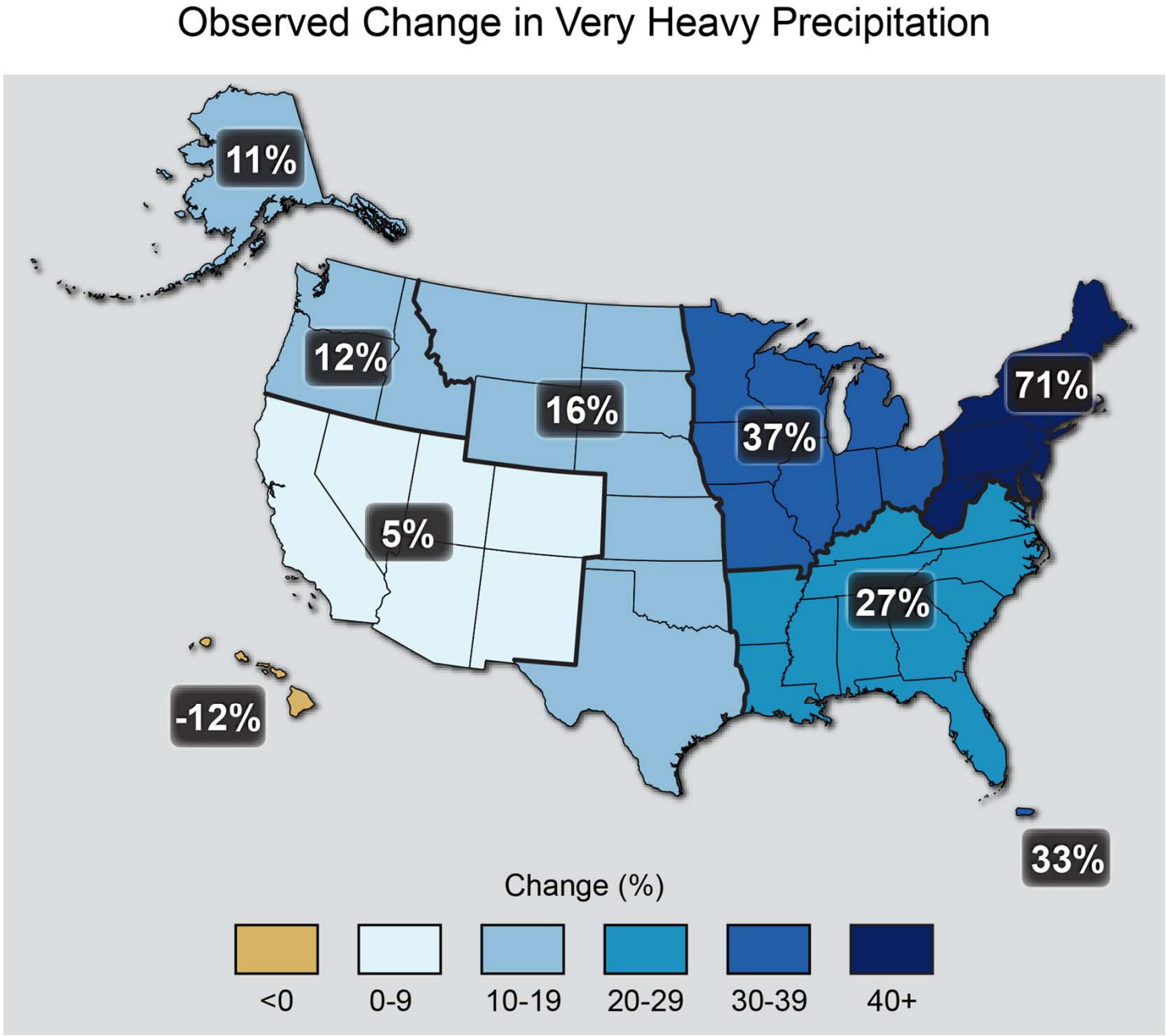
INCREASING PRECIPITATION



INDIANA

Linear annual and seasonal precipitation trends
based on NOAA NCEI data (1895-2015)

IN CCIA



Percent increase in the amount of precipitation falling in very heavy events (defined as the heaviest 1% of all daily events) from 1958 to 2012.

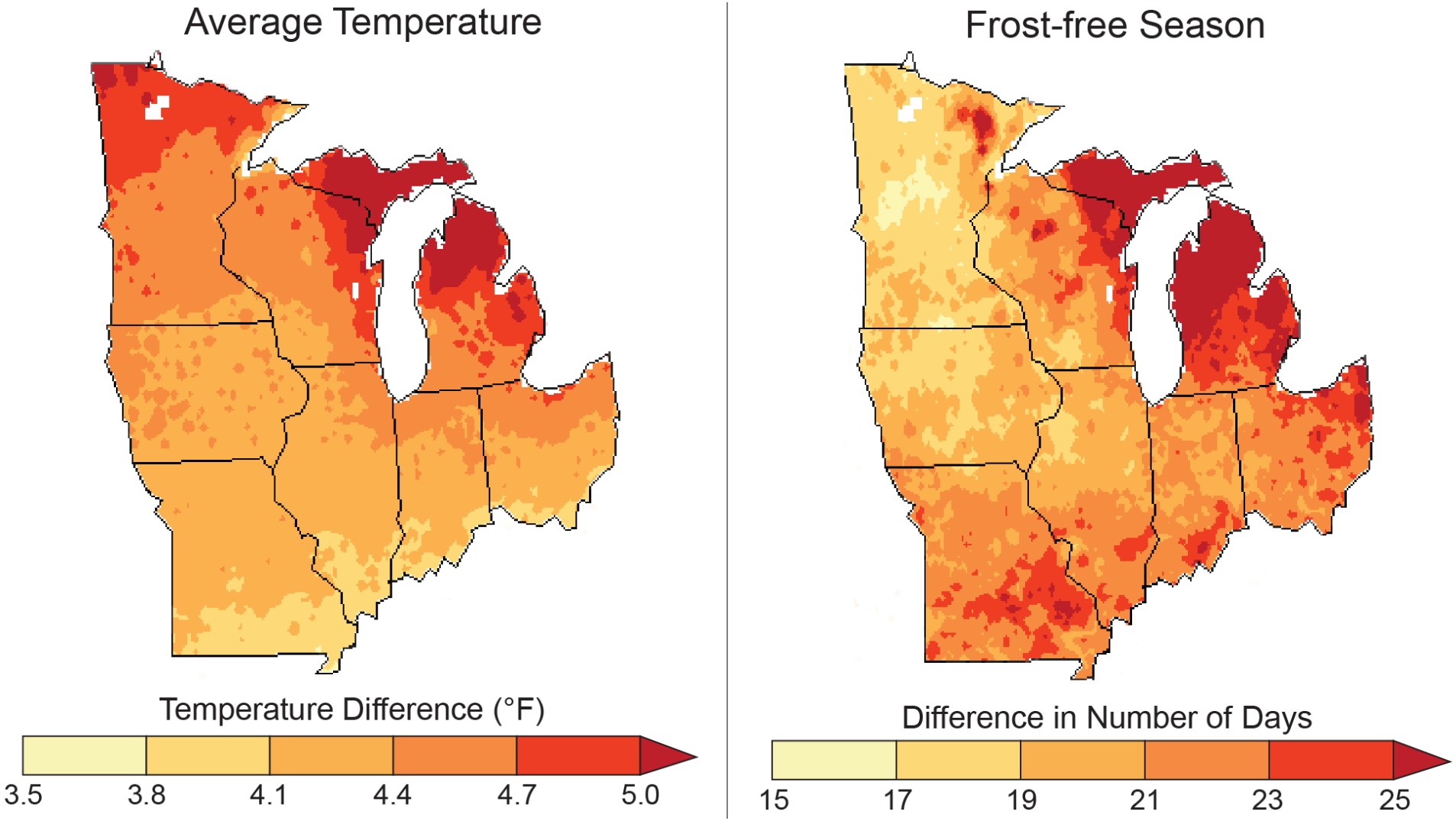
(Figure source: updated from Karl et al. 2009; accessed from National Climate Assessment 2014)

Future Climate for Indiana

Trend of warmer, wetter conditions continue

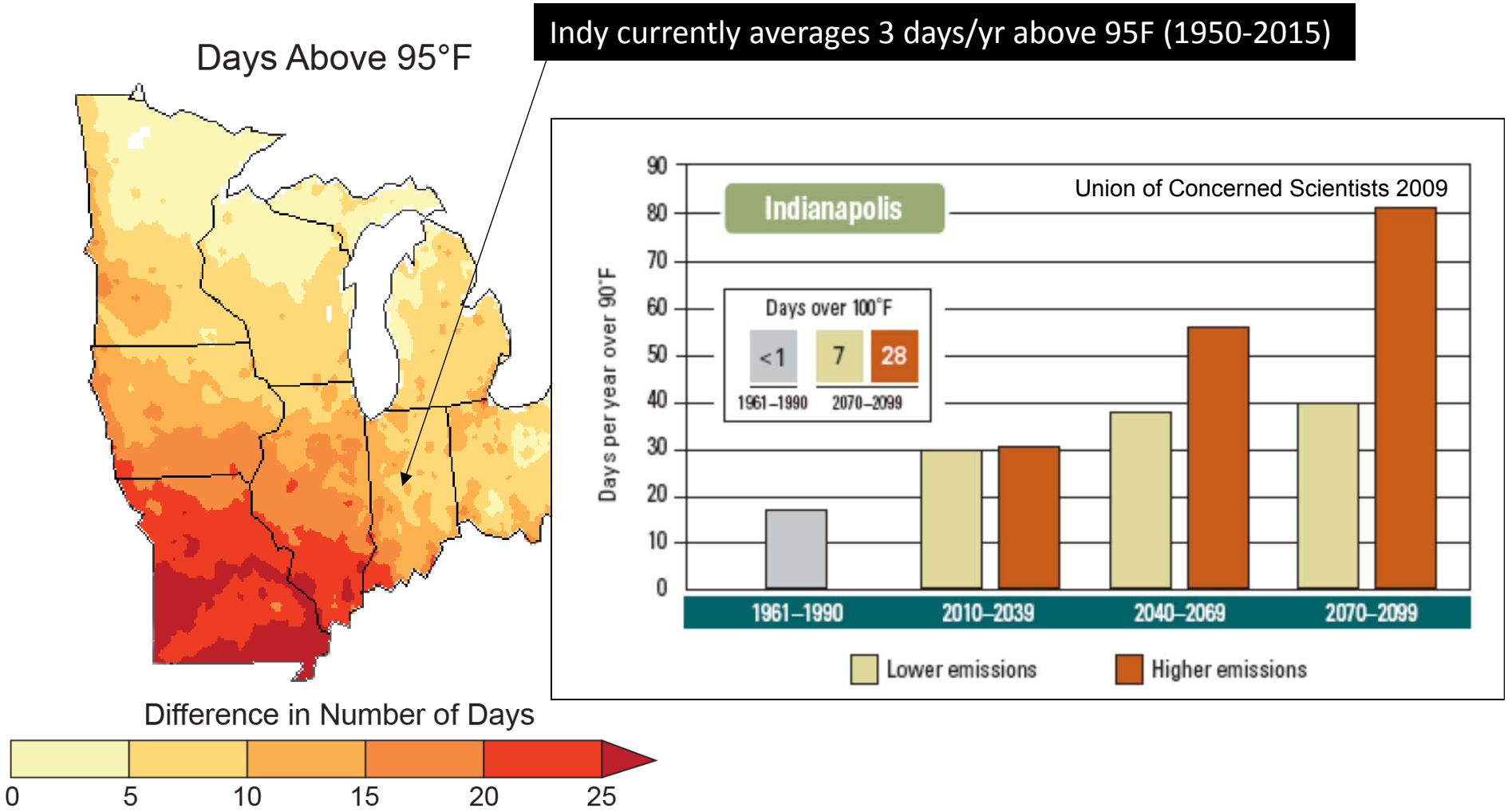
- Flood
- Heat
- Air pollution

Projected change 25-55 years from now



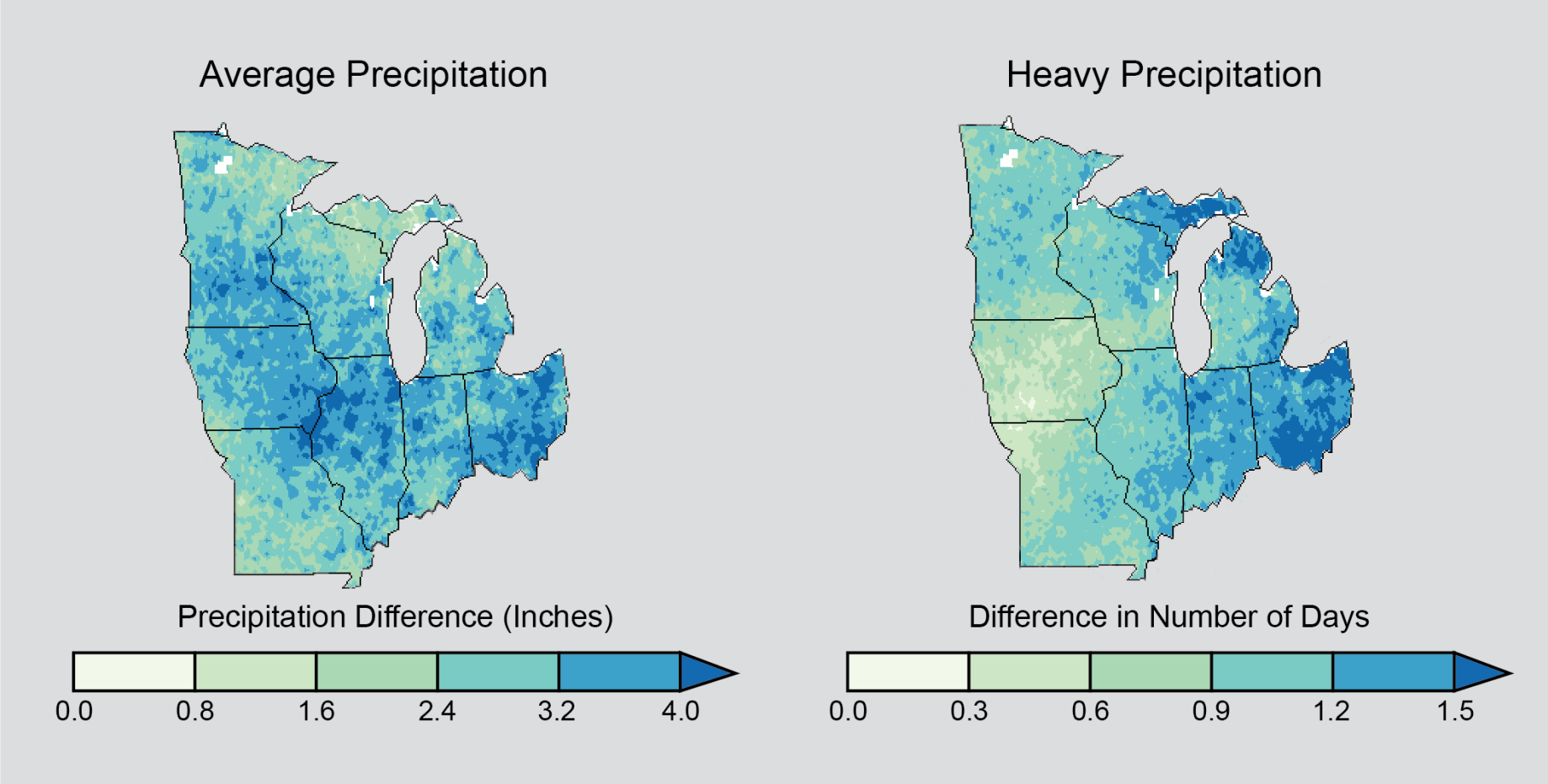
National Climate Assessment 2014

Projected change in days/year over 95F 25-55 years from now



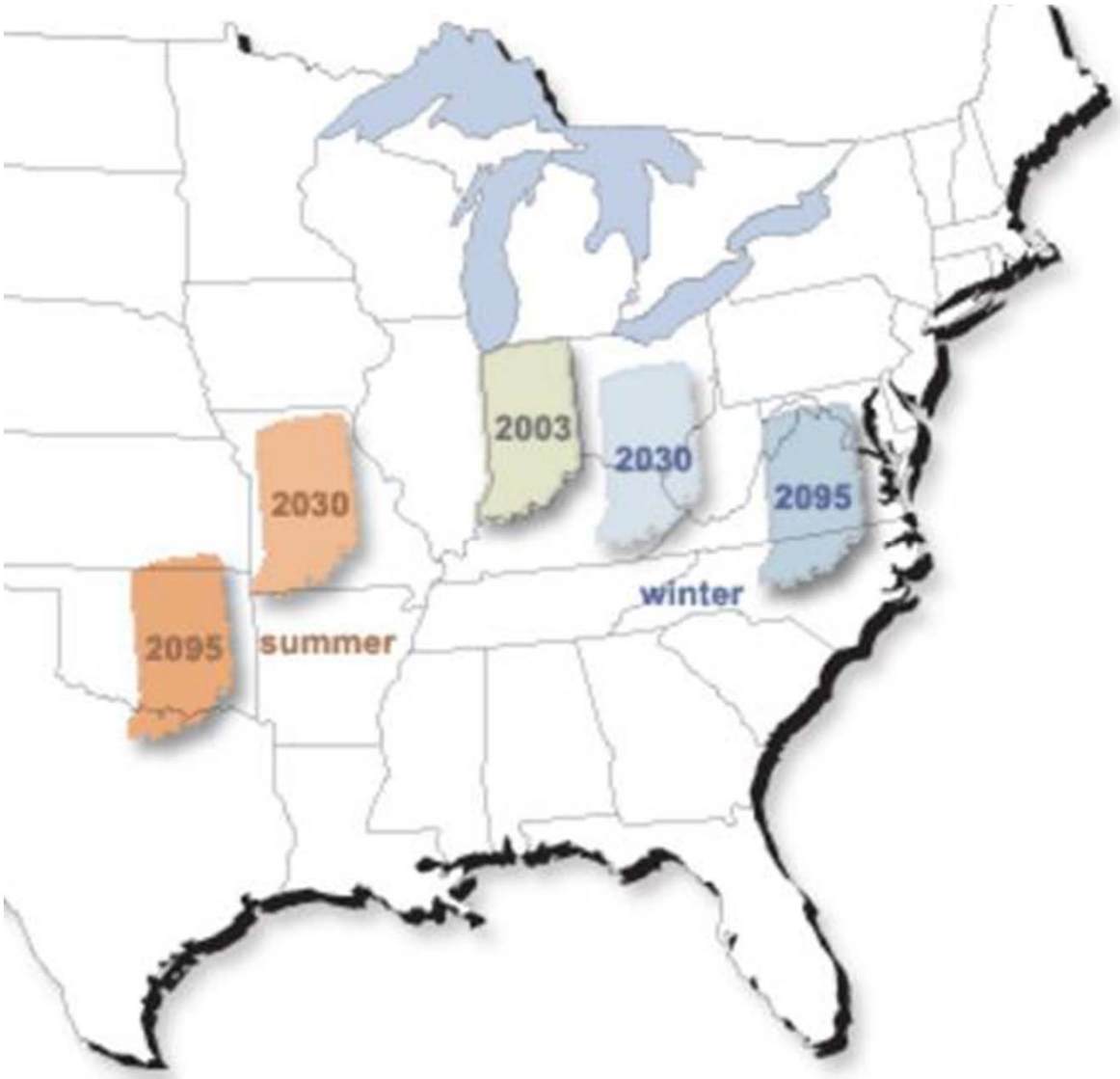
National Climate Assessment 2014

Projected changes in precipitation 25-55 years from now



National Climate Assessment 2014

Impacts of Climate Change: Indiana Summary



Union of Concerned Scientists, 2009

By the end of the century, Indiana summers may feel like those of current-day Oklahoma

Analysis is based on changes in average summer heat index

2014 National Climate Assessment
Human Health

MIDWEST: Public Health Risks
- **Increased heat waves**
- **Increased humidity**
- **Reduced air & water quality**

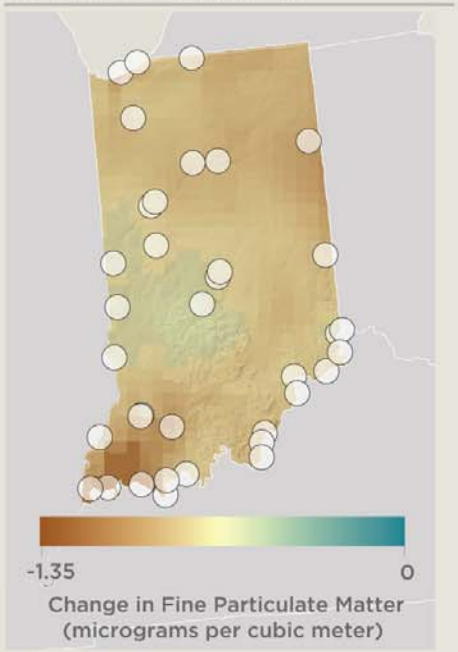
- Key message 1: Wide-ranging health impacts
- Key message 2: Most vulnerable at most risk
- Key message 3: Prevention provides protection
- Key message 4: Responses have multiple benefits

INDIANA: A Health Benefits Hotspot

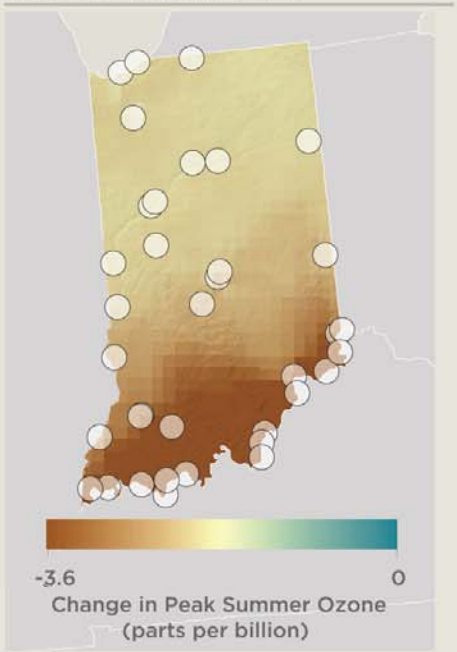
AIR QUALITY AND HEALTH BENEFITS OF A POWER PLANT CARBON STANDARD

INDIANA'S AIR →

SOOT Reduced in 2020



SMOG Reduced in 2020



INDIANA'S HEALTH →

Cumulative Lives Saved from 2020 to 2030

1100

Cumulative Hospitalizations Prevented from 2020 to 2030

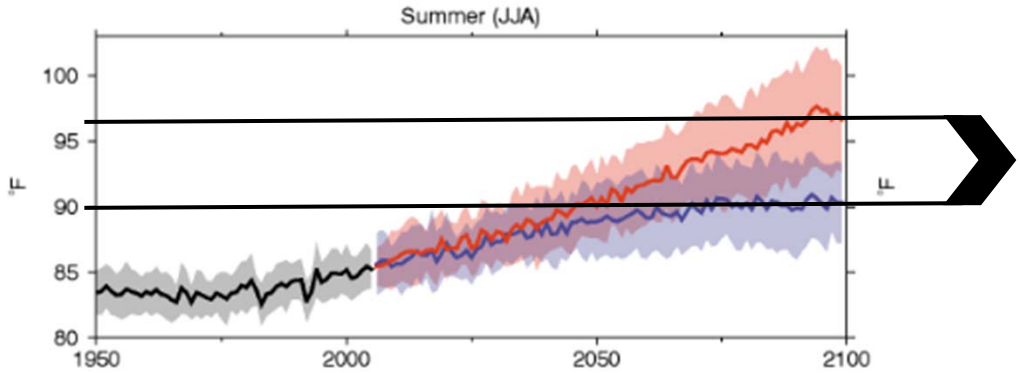
400

Cumulative Heart Attacks Prevented from 2020 to 2030

80

○ Operating Coal Plants

THESE MAPS SHOW: Reductions in fine particulate matter and peak summer ozone, and the resulting health benefits under Policy Scenario 2 compared to the 2020 reference case. For soot and smog, negative values = lower pollution. The health benefits assume a linear increase from the 2020 annual estimate. By comparison, Scenario 1 resulted in 120 additional premature deaths, and Scenario 3 resulted in 1200 lives saved. Source: *Health Co-benefits of Carbon Standards for Existing Power Plants*. www.chgeharvard.org/health-co-benefits.



Where we end up is directly related to the actions taken today!

Climate Change X Environmental Exposure

- Very little study on effects of climate change on environmental exposures from toxic release among other environmental burden
- Climate Change and Environmental Exposure in Near West
  - First prize in NIH/NIEHS Climate Change and Environmental Exposure Visualization Challenge
  - Replicable to other US locations (standard manuals, public data etc)

Environmental Factor

APRIL 2016

National Institute of Environmental Health Sciences

Climate Challenge winners collaborate across disciplines

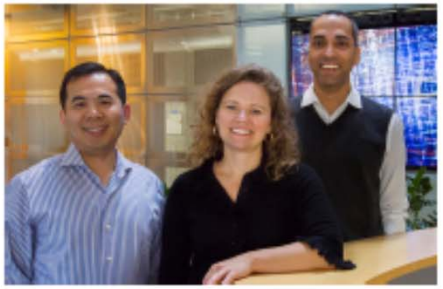
By John Yewell

On Feb. 23, NIEHS announced winners of its Climate Change and Environmental Exposures Challenge (//niehs.nih.gov/funding/challenges/climate_change/index.cfm) , naming a first place winner in both the national and local categories, and two second place winners in the local category, with a total of $30,000 in prizes.

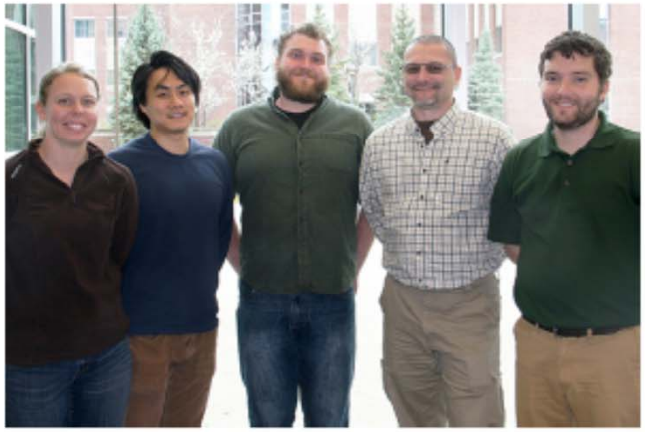
The challenge invited innovators and environmental health specialists alike to develop data visualization tools and maps that will help decision-makers and the general public respond to the environmental health risks presented by climate change. NIEHS has posted links to the winning tools on the webpage linked above.

"The study of how climate change impacts environmental exposures has been relatively neglected," said John Balbus, M.D., NIEHS senior advisor for public health. "The challenge provided new tools for understanding and responding to developments that may alter human exposure to pollutants and toxins."

The challenge, issued Sept. 15, was part of the Climate and Health Innovation Challenge Series (https://www.challenge.gov/agency/department-of-health-and-human-services/climate-and-health-innovation-challenge-series/) . Entries were judged on scientific validity, innovation and usability, and



NIEHS grantee Gohlke, center, collaborated with Xie, left, and Swarup of the Network Dynamics and Simulation Science Laboratory. (Photo courtesy of Ivan Morozov)



The team from Indiana University included, from left,

Climate Change and Environmental Exposure in Near West

- Flooding (under climate change)
  - On critical infrastructure
  - On hazardous waste sites
- Extreme Heat (under climate change)
  - Urban heat island
  - Higher rates of 911 heart attack, myocardial infarction, and stroke
- Air Pollution (under climate change)
  - Potential higher ozone formation

Implication

- Identify hotspots and populations at risk of increased environmental exposures under climate change
- Make right-to-know information more easily accessible and build capacity to effect change
- Offer evidence for Homeland Security for emergency response
- For both policymakers and community
- Can be replicated easily to other US locations

Discussion

Suggestions and Comments are needed and welcome!

Thank you!

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