

Climate Change Impacts on Public Health and Security

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Climate Reality Leader
November 2018



The Climate Reality Project[®]

What is Security?

The absence of war?

The absence of invaders or terrorism?

Having enough food?

Having enough clean water?

Having air conditioning in a heat wave?

Having refrigeration?

Having a home?

Having medical care readily available when you need it?

Having a job?

**“Climate Change
is a
Medical Emergency.”**

**Professor Hugh Montgomery, Co-Chair,
The 2015 Lancet Commission on
Health and Climate Change**

June 2015

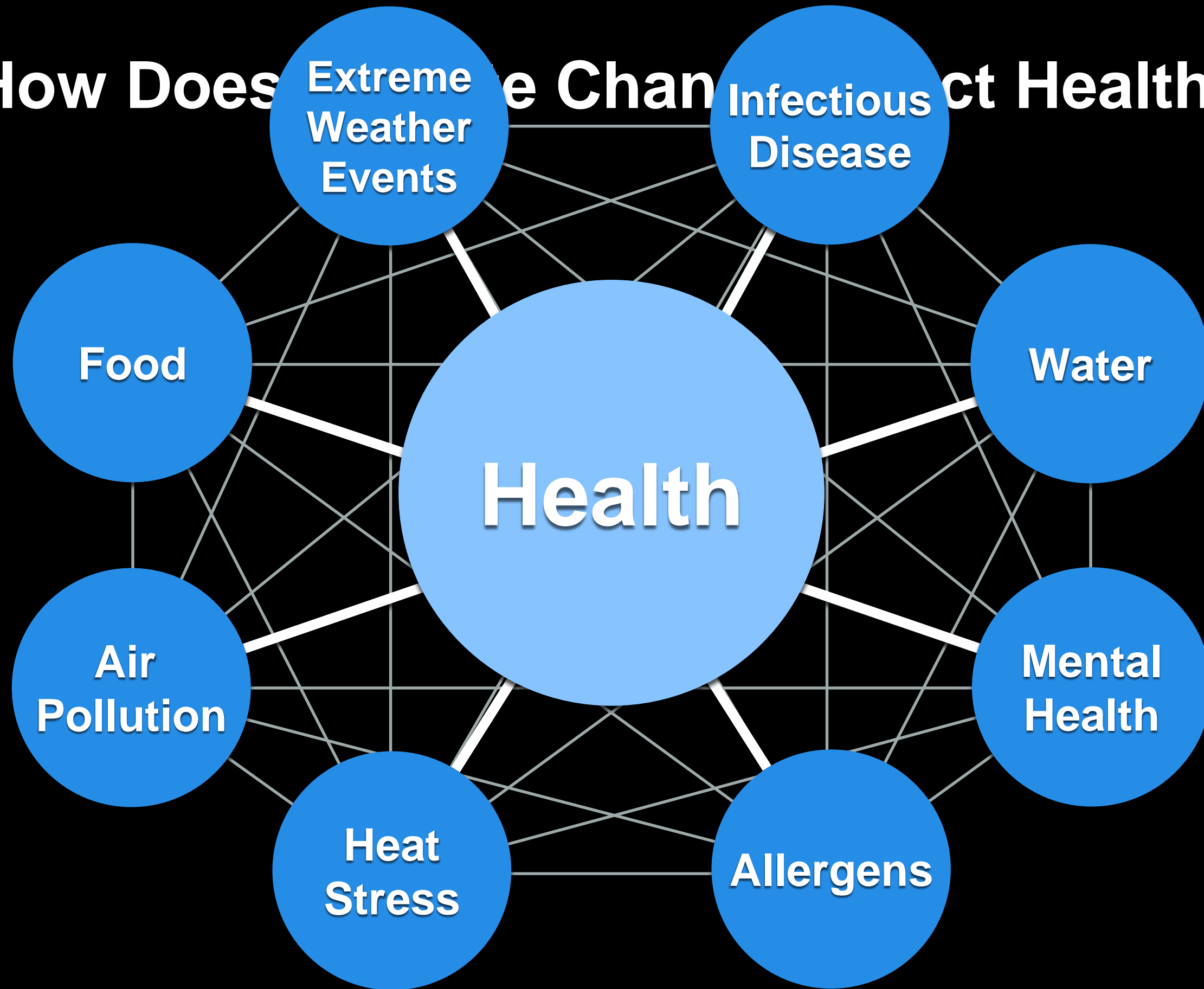
**“Every American is vulnerable to
the health impacts associated
with climate change.”**

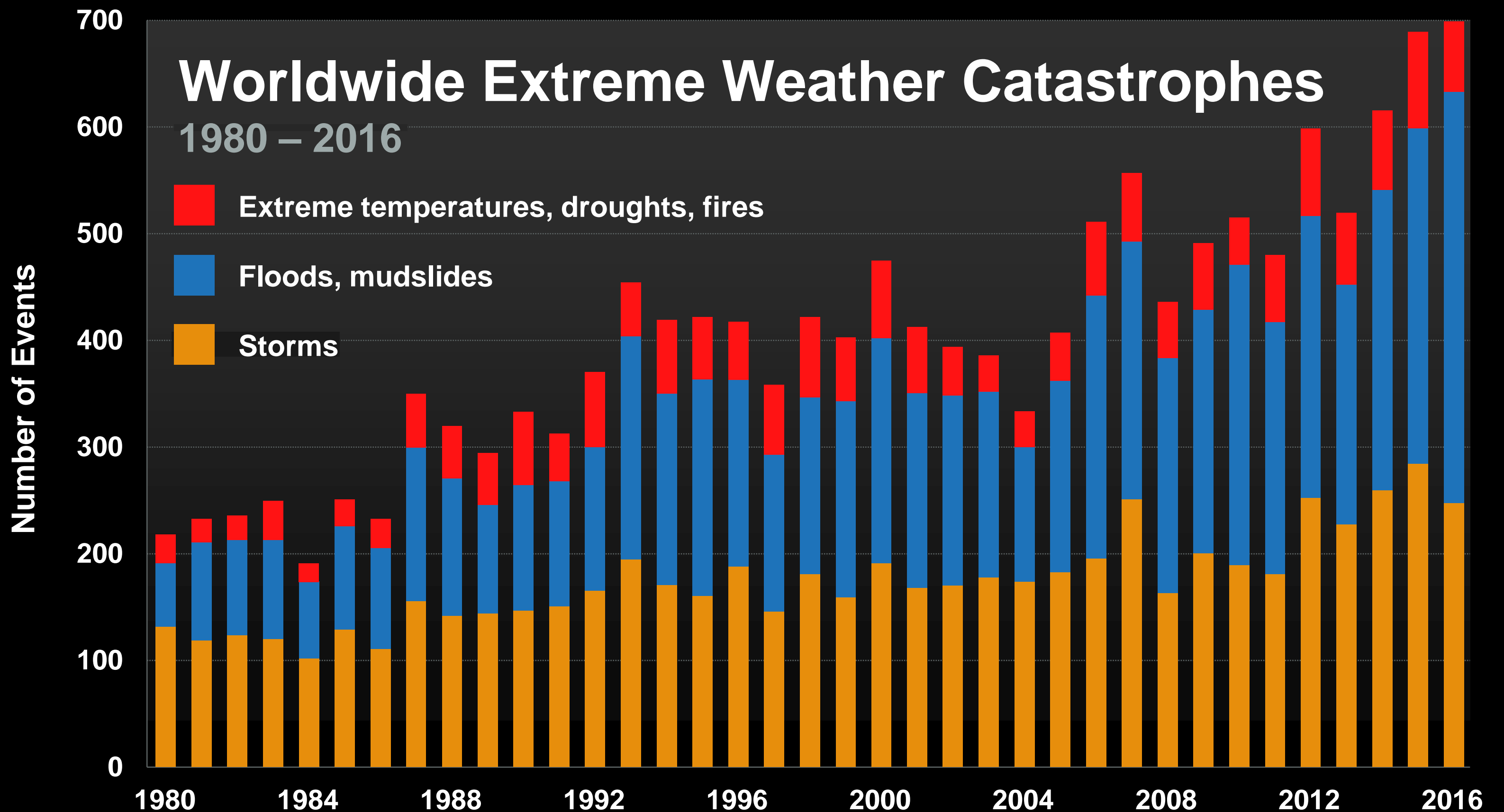
The Impacts of Climate Change on Human Health in the United States

A Scientific Assessment

2016

How Does Climate Change Affect Health?





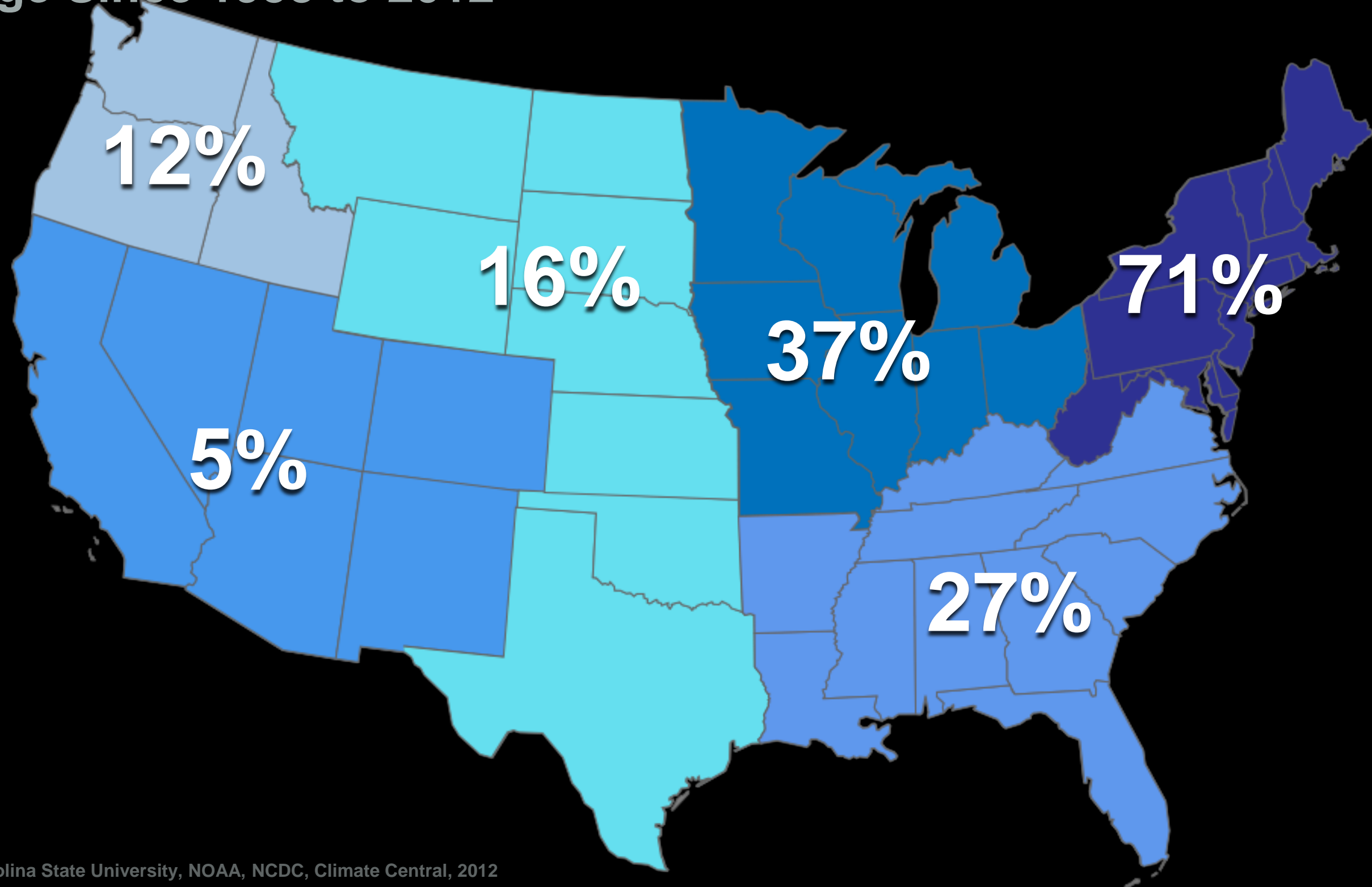
**Warmer air can
hold
a lot more water vapor**

With each additional 1° (C) of temperature, the atmosphere's capacity to hold water vapor increases by 7%

**There is already 4% more water
vapor over the oceans than there
was only 30 years ago**

Heavy Downpours Are Increasing

% Change Since 1958 to 2012



Fenton, Missouri

May 4, 2017

Parts of Missouri experienced a 1-in-1,000 year rainfall between April 28 and May 4 2017.



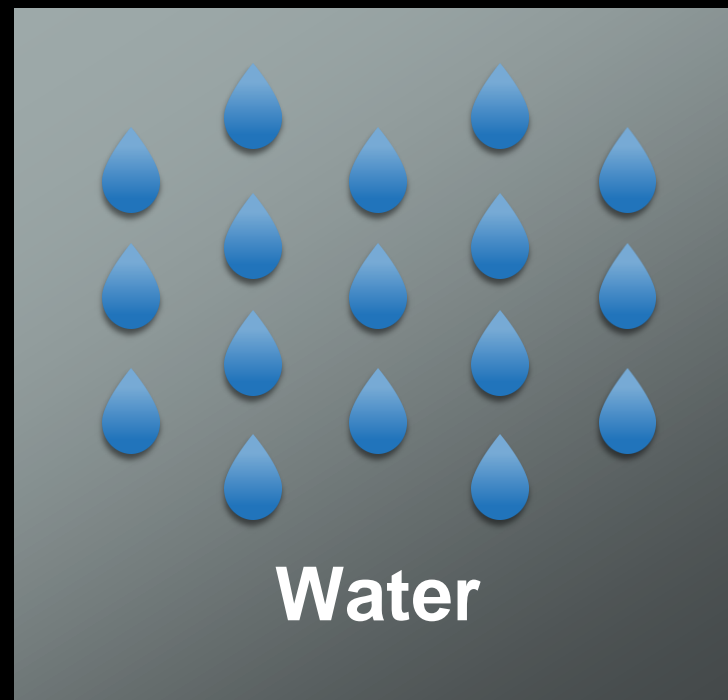
There have been
seventeen 1-in-1,000 year
downpour **events** in the U.S.
since May of 2010

Children are especially vulnerable to flood health impacts due to their developing immune systems

- Contaminated water (chemicals, water-borne illnesses)**
- Disruption of drinking water supplies**
- Disruption of wastewater treatment and waste treatment facilities being overrun by water**
- Loss of power for refrigeration or cooking can lead to food-borne illnesses**

Global Systems Vulnerable to Climate

Disruptions May Lead to Political or Societal Instability



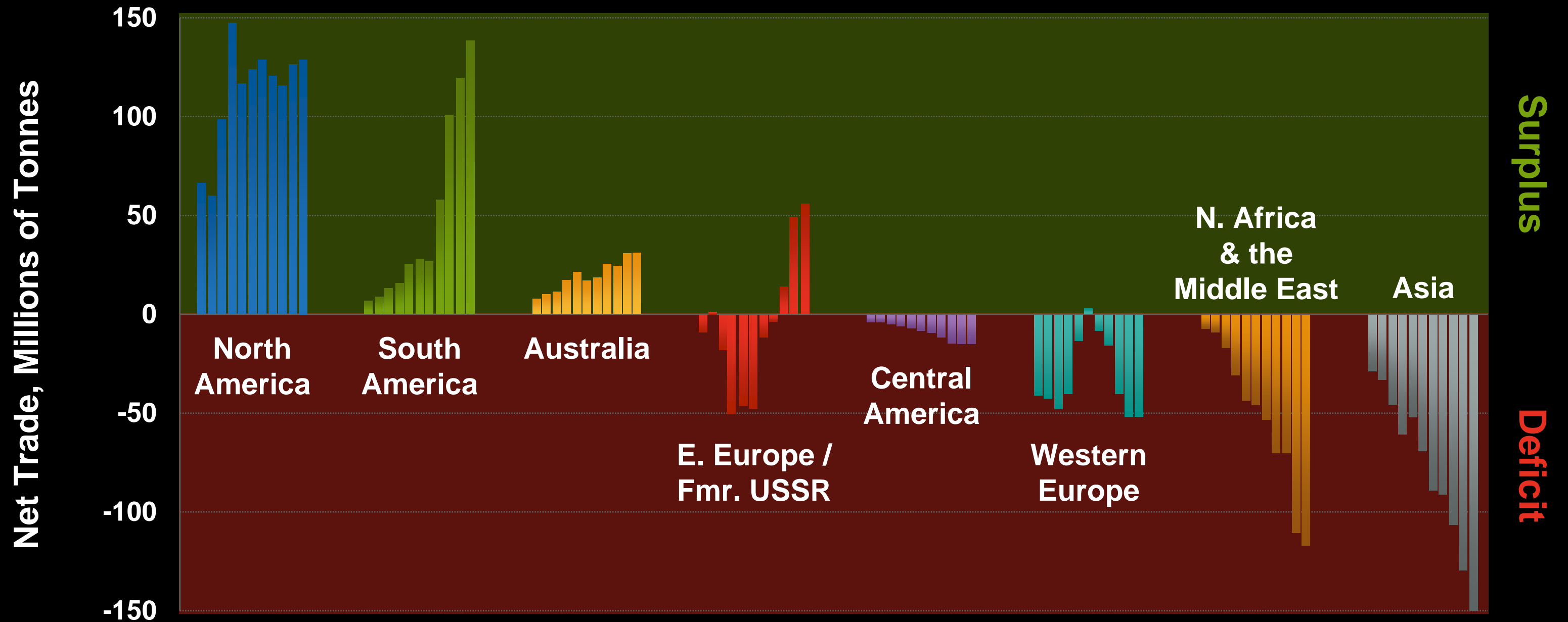
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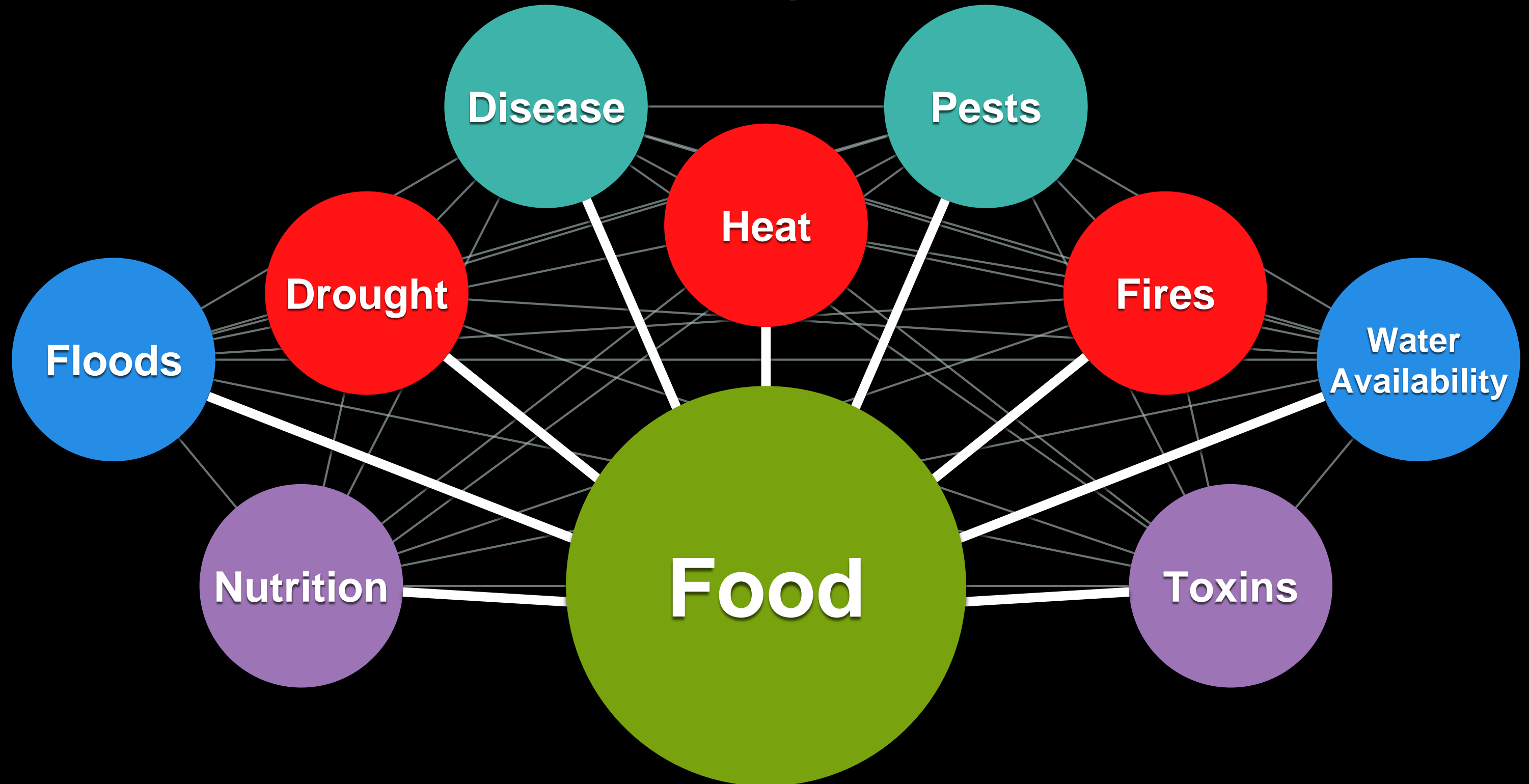


Food Surpluses and Deficits

1965 – 2012



How Does Climate Change Affect Food Supply?





**Rising concentrations of CO₂ are
threatening global nutrition by
reducing levels of nutrients
in food crops like rice, wheat, and soybeans.**

Source: Bloom, et al., "Increasing CO₂ threatens human nutrition," *Nature*, April 2014
Photo: © 2007 iStockphoto/Anzelm

Farmingdale, Illinois

July 16, 2012

“It’s like farming in Hell.”

Fred Below

Plant biologist, University of Illinois in Urbana

July 2012

Floods, droughts, heat waves, pests and extreme weather can all destroy crops

Current research indicates that...

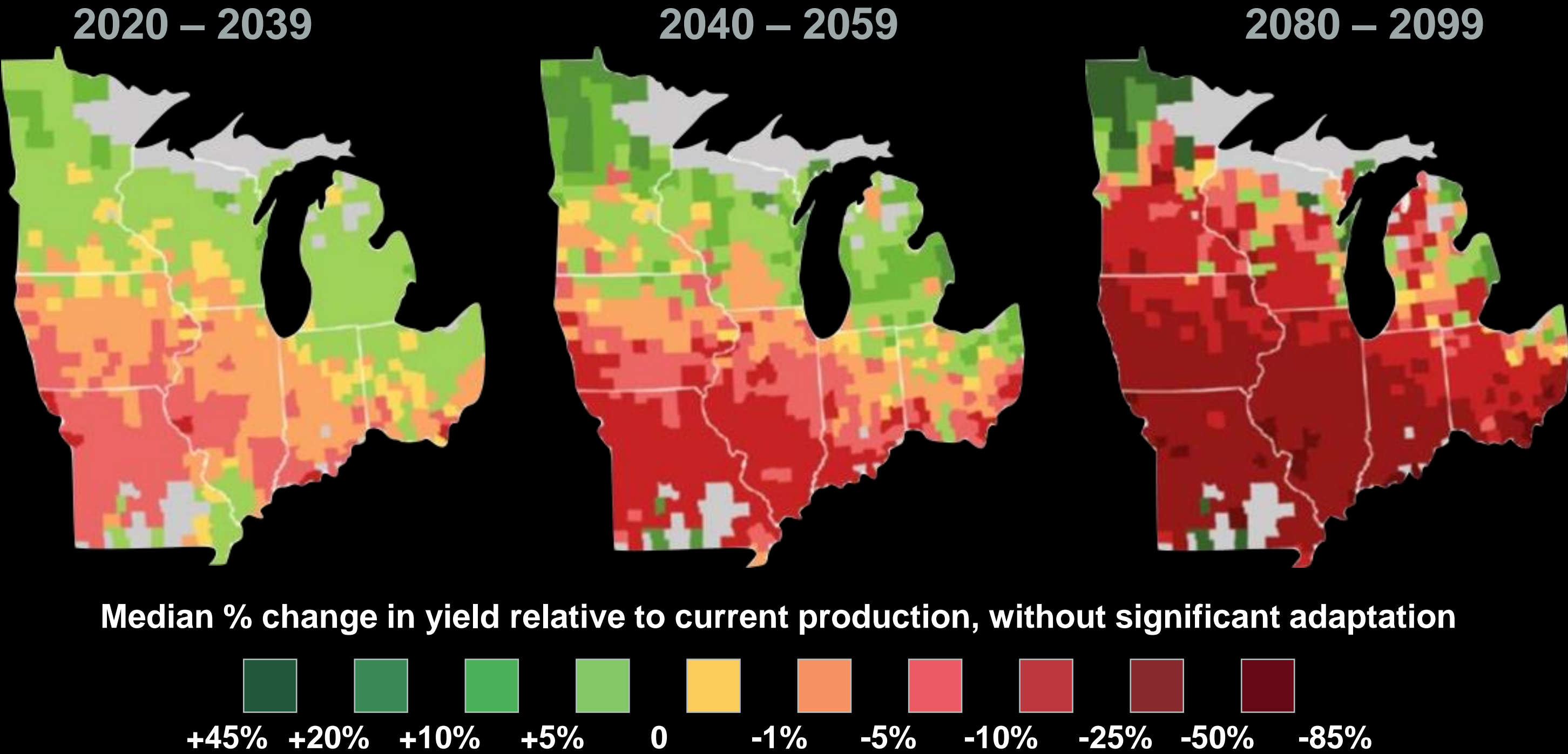


For every day during the growing season that temperatures go above 29° C (84° F), corn yields decline by 0.7%



By the end of the century, U.S. corn yields could fall by 1/3 from heat stress alone


Projected Change in Corn, Soybean, and Wheat Yields



Source: Risky Business Project, Heat in the Heartland: Climate Change and Economic Risk in the Midwest, January 2015

An increase in plant pests and diseases

can lead to increased use of chemical pesticides and fungicides which may result in increased human exposure to chemical contaminants in the food chain.



93% of the extra **Heat**
trapped by manmade
global warming pollution
goes into the
Ocean

**By 2050, warmer waters
in the southern Philippines
could cause the
maximum fish catch to
decrease by 50 percent.**

**Populations of marine
vertebrates declined
49% on average
from 1970 to 2012**



**Coldwater
species such
as salmon and
trout may be
unable to shift
their territory
as their habitat
warms.**

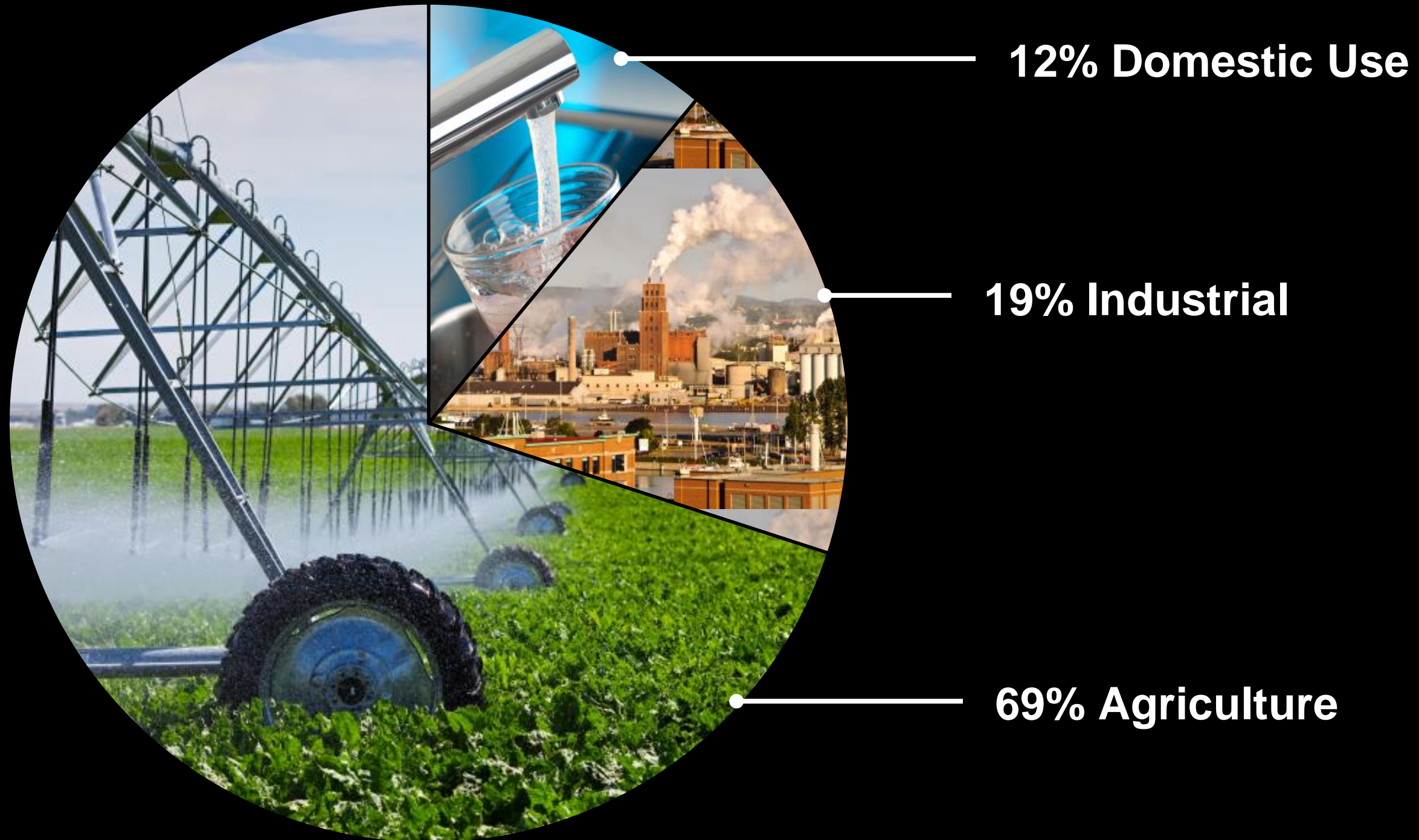


Global Systems Vulnerable to Climate

Disruptions May Lead to Political or Societal Instability



Global Water Use



As Temperatures Rise, So Does Water Use



People



Crops



Energy



Industry



Animals

**Water scarcity
affects
more than 40%
of the world's
population**

Cameron MO has only 167 days of water supply

Columbia Daily Tribune, August 26, 2018

State to run drinking water pipelines to Cameron and Caldwell County

Columbia Daily Tribune

CAMERON Emergency pipelines planned in northwest Missouri

The state of Missouri plans to help fund temporary emergency water pipelines in two parts of northwest Missouri.

Gov. Mike Parson met

Friday with local officials to discuss \$77,000 in emergency funding to address the drought's impact on drinking water supplies in Cameron and in Caldwell County.

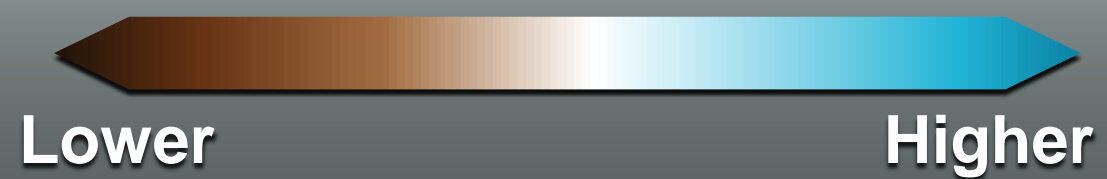
The St. Joseph News-Press reports as of this week, Cameron's reservoirs had only 167 days of water supply.

The state grants will help Cameron build three miles of temporary, above-ground piping to pump water from Pony Express Lake to Grindstone Reservoir, which would provide more than 1 million gallons of water per day.

The Caldwell County project involves a temporary emergency connection with Daviess Public Water Supply District Number 2, which is expected to provide more than 30,000 gallons per day.

**The same extra heat that evaporates water from the ocean
pulls moisture even more quickly from the soil**

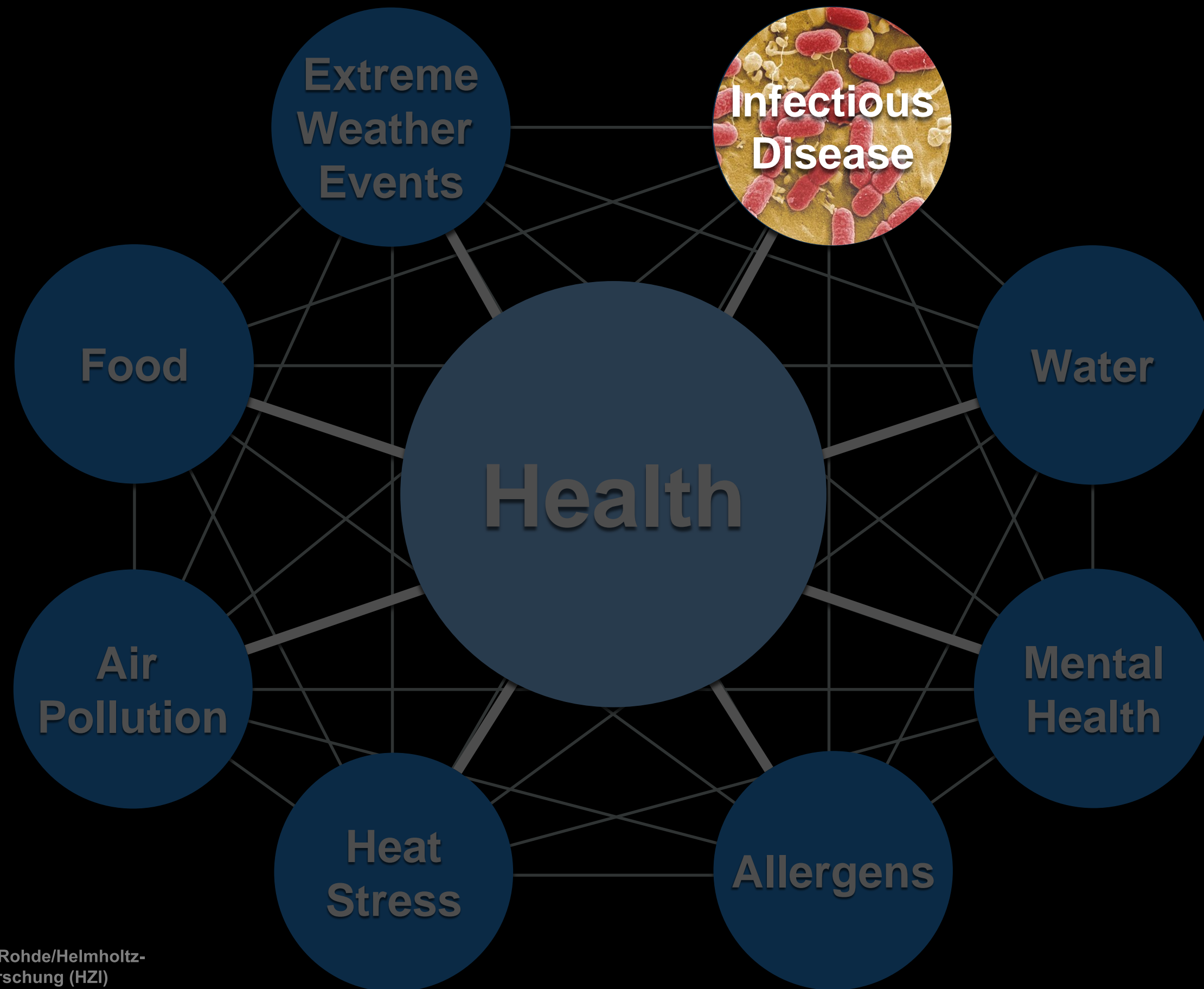
**Soil Moisture in 2095 Compared
to 20th Century Average**



Global Systems Vulnerable to Climate

Disruptions May Lead to Political or Societal Instability



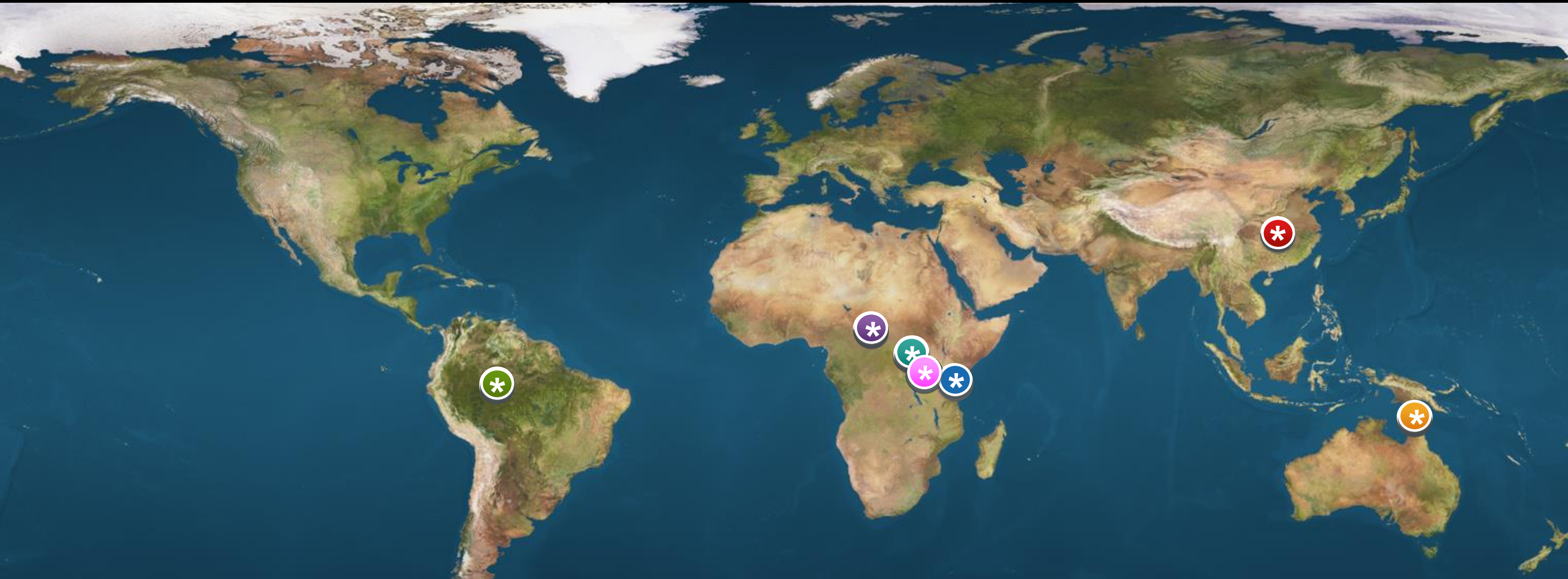


**“Climate change is
disrupting natural ecosystems
in a way that is making life
better for infectious diseases.”**

Andrew Dobson

Department of Ecology and Evolutionary Biology, Princeton University

Tropical Diseases on the Move



West Nile Virus



Chikungunya



Cryptococcus Gattii fungus



Zika Virus



Rift Valley Fever



Chagas Disease



Dengue Fever

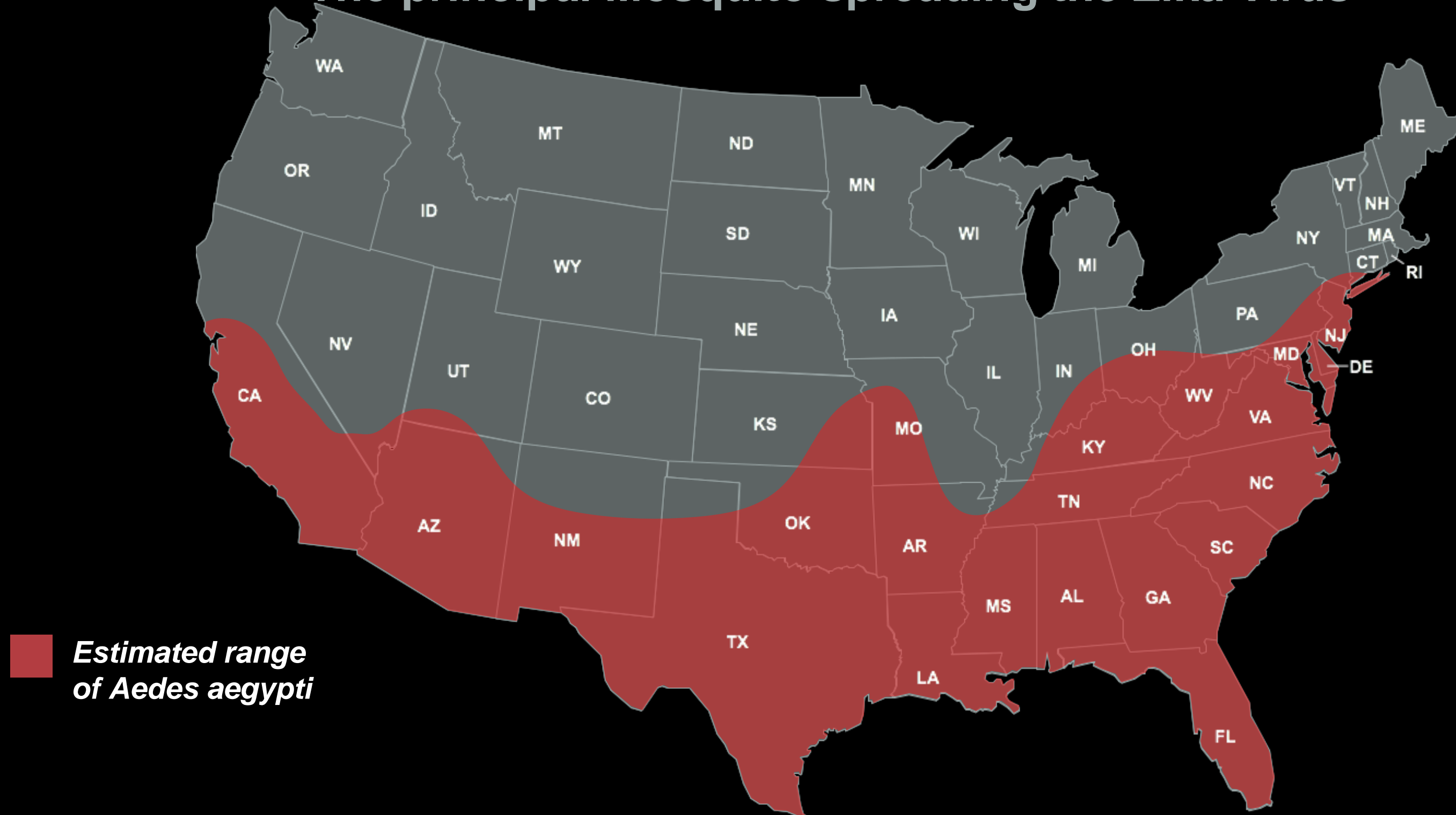
People and Moose Under Threat



Winter ticks increase as the climate warms, causing sickness and death


Aedes Aegypti Range in the Continental U.S.

The principal Mosquito spreading the Zika Virus



**Runoff and flooding resulting from
increases in extreme precipitation,
hurricane rainfall, and storm surge
will increasingly contaminate
our water sources.**

U.S. EPA

A photograph showing a man wading through deep floodwaters in a residential neighborhood. The water is murky and reaches up to the man's chest. In the background, there are houses and trees, some of which are partially submerged. The man is shirtless, wearing dark shorts and a cap, and is smiling while holding his head with one hand.

**More than two-thirds
of waterborne disease
outbreaks in the U.S. have
been preceded by extreme
precipitation events.**

Data: USGCRP
Photo: © 2015 Matt Ryerson/The Journal-Star via AP

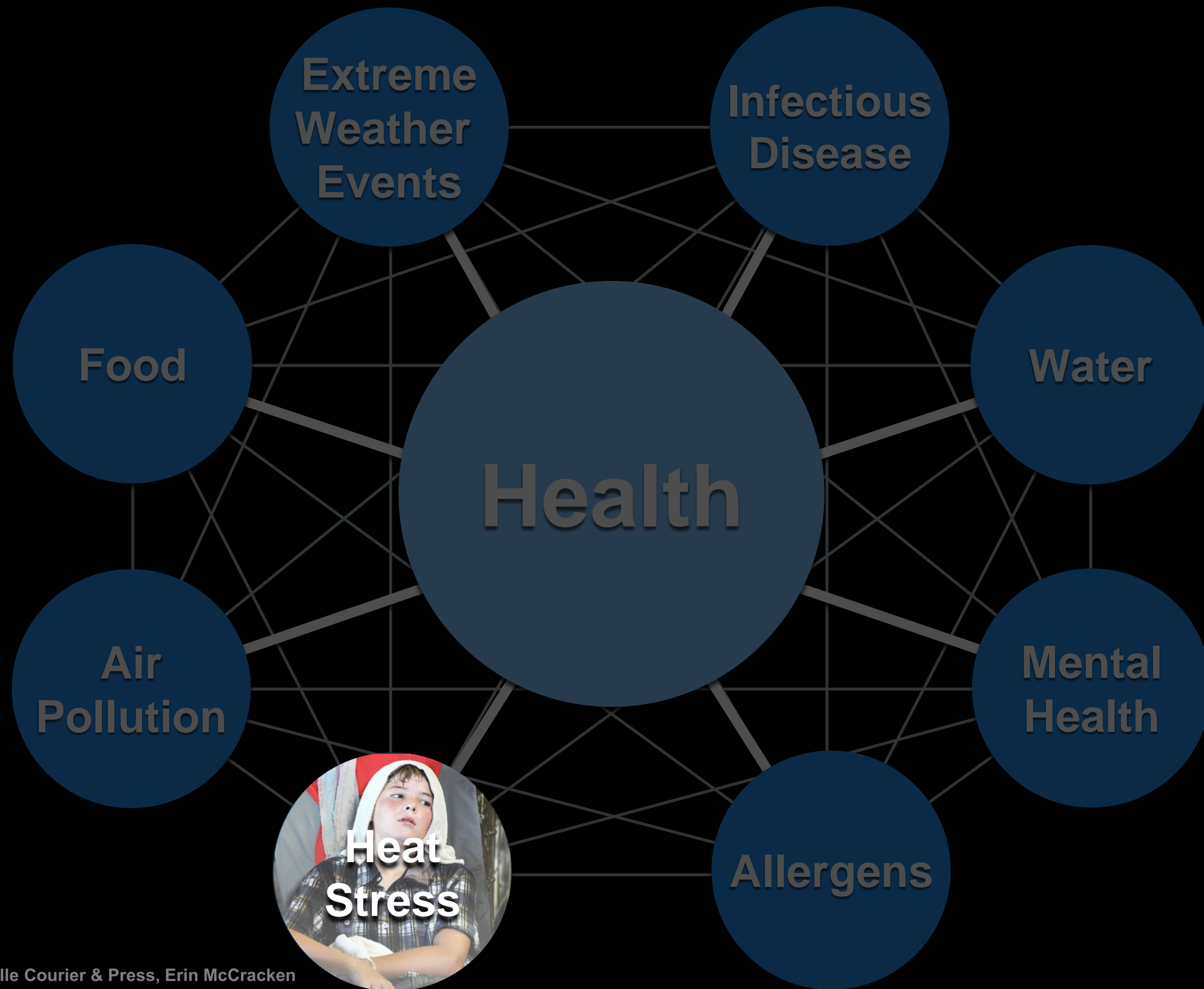
*De Witt, Nebraska
May 7, 2015*

“The best defence against increases in infectious disease burden related to climate change lies in strengthening existing public health infrastructure. Physicians, as opinion leaders, can also influence public policy related to greenhouse gas emissions.”

Amy Greer, PhD, et al.

**“Climate Change and infectious diseases in North America: the road ahead”
Canadian Medical Association Journal
March 11, 2008**

<http://www.takepart.com/article/2014/09/28/meet-new-climate-change-warrior-your-doctor>



Climate change has **already** made extremely hot days 4 to 5 times more common

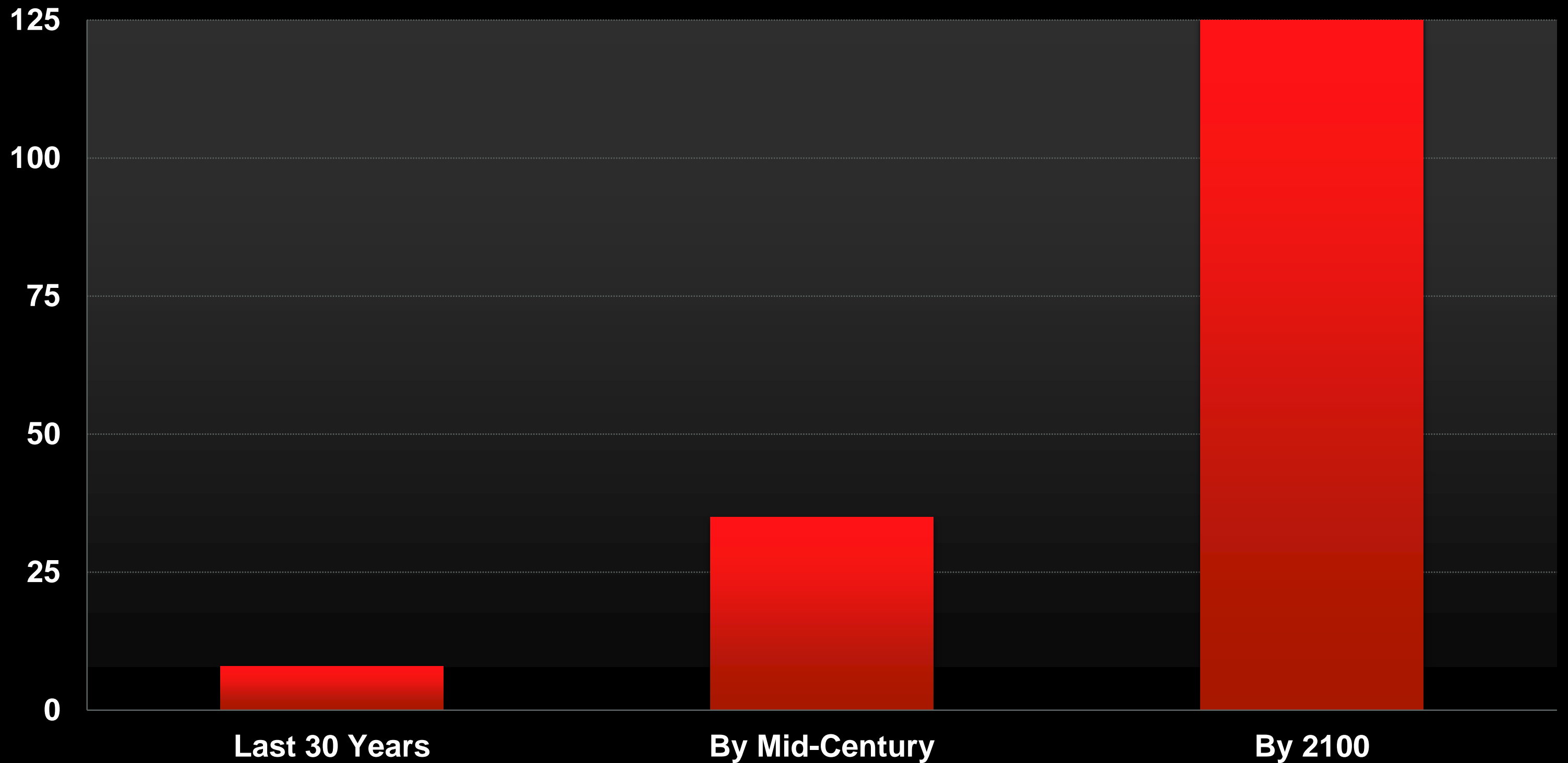
**Extreme heat events cause
more deaths annually
in the U.S. than all other
extreme weather events combined.**

A photograph of an elderly man with a long white beard and closed eyes, lying on a dark red patterned mat. He is wearing a white long-sleeved shirt. His right arm is raised above his head, and his left hand rests on his chest. Three clear plastic water bottles with blue caps are placed on the mat near his head. The background is a plain, light-colored wall.

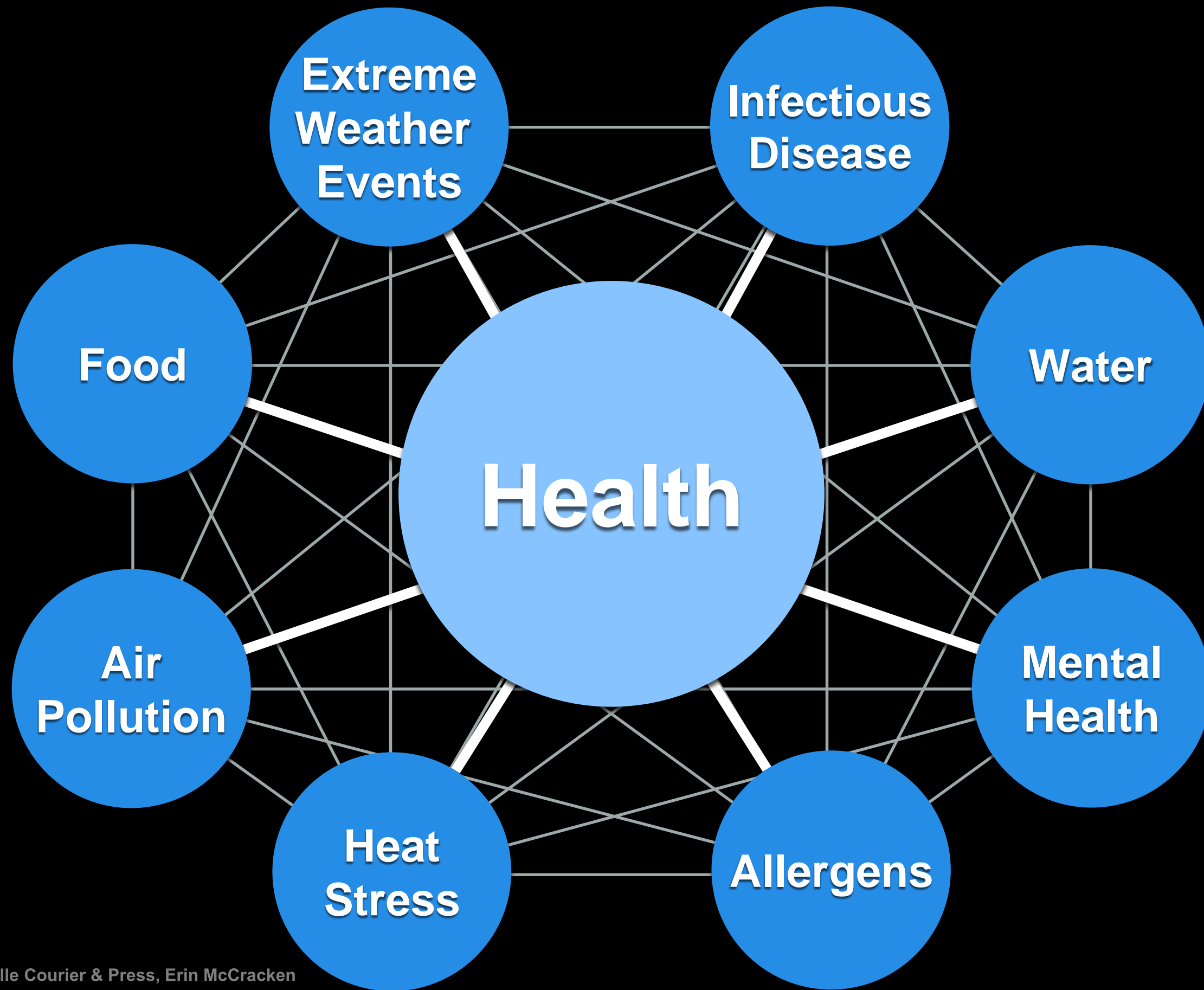
Who Is Most Vulnerable to Heat?

- The poor
- The elderly
- Infants and children
- Those with pre-existing medical conditions
 - Particularly cardiac and respiratory conditions
- The mentally ill

Days Per Year Over 95° in St. Louis



Source: *Risky Business Project, Heat in the Heartland: Climate Change and Economic Risk in the Midwest*, January 2015

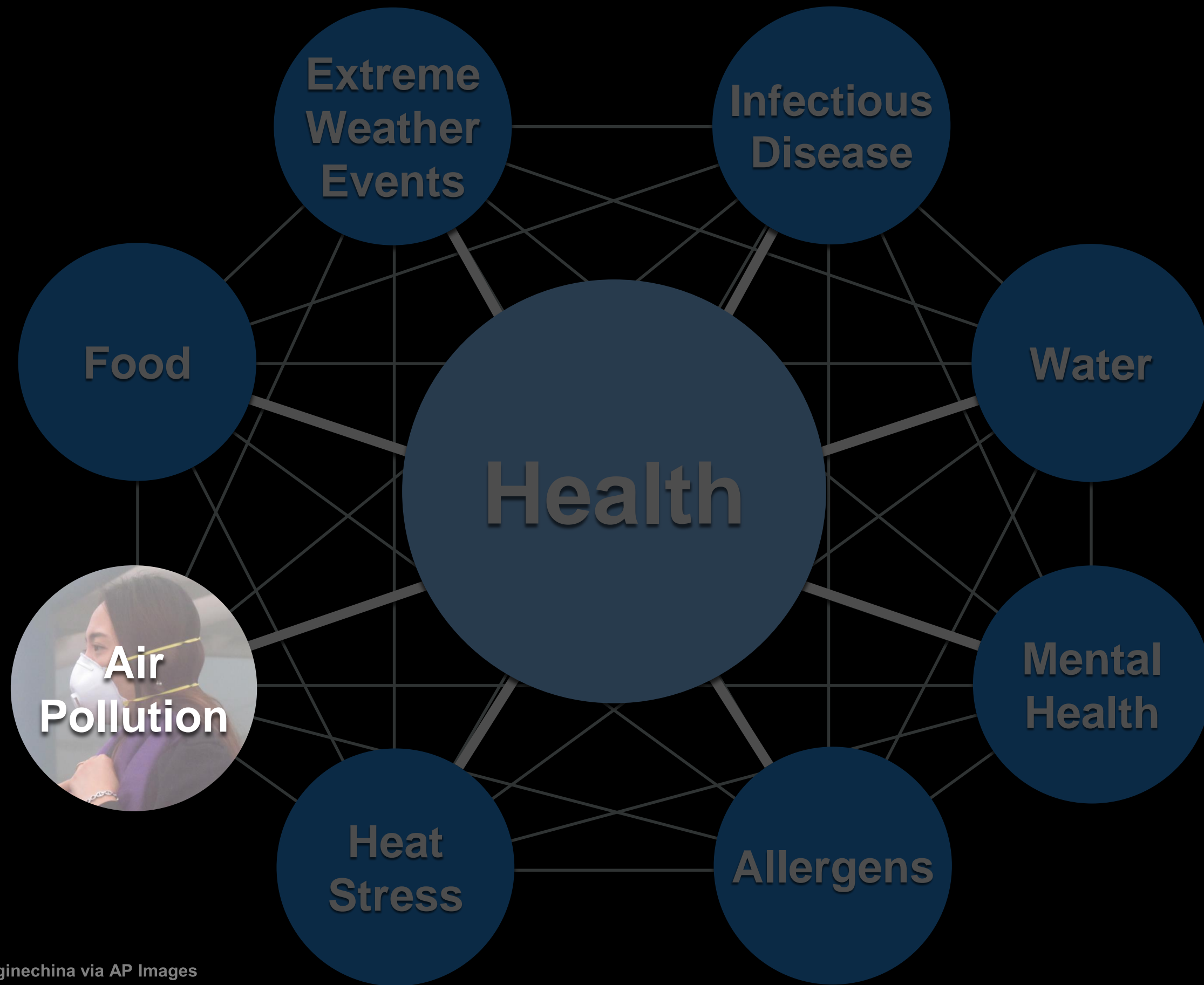


Three key mental health implications of climate change

1. Direct impacts of climate change, such as extreme weather events
 - Have immediate impacts on the prevalence and severity of mental health issues in affected communities
 - Have significant implications for mental health systems
2. Disruptions to the social, economic and environmental determinants that promote mental health
3. Climate change may create emotional distress and anxiety about the future

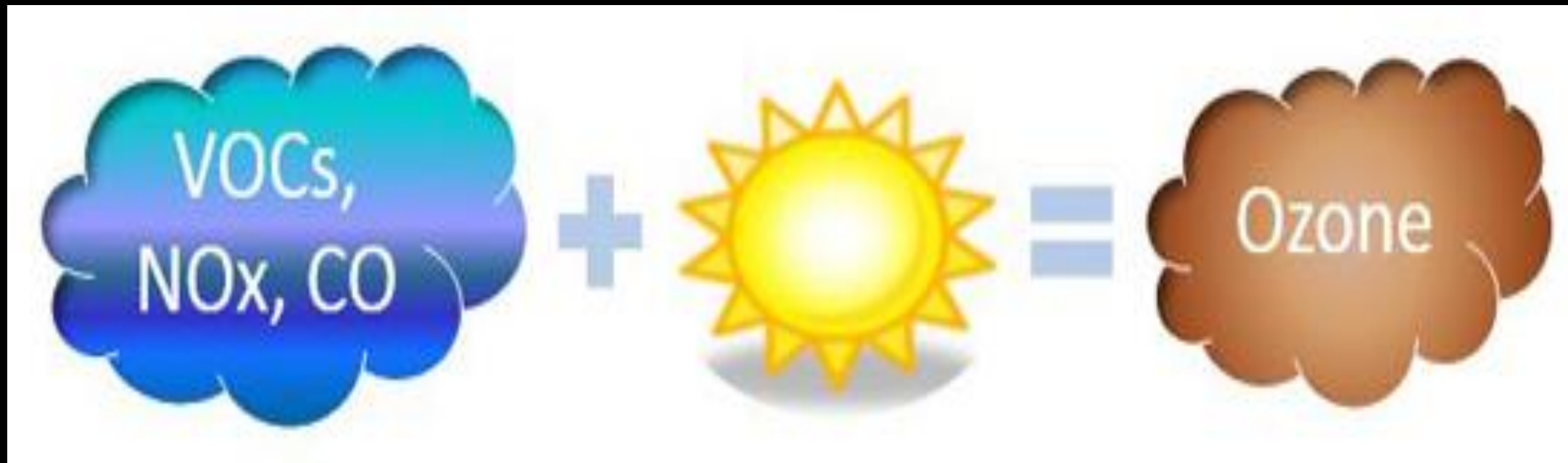
Violence against women increases after weather disasters

“After ... one of the deadliest tornadoes in U.S. history in 2011, the residents of Joplin, Missouri, learned first hand that natural disasters beget personal crises. The community reeled as domestic violence cases increased by 40% and demand for beds in women’s shelters doubled.”



**Worldwide,
air pollution kills
6.5 million people
every year**

**Mortality from air pollution costs the
U.S. nearly 4% of its annual GDP**



Ground level Ozone is an invisible air pollutant.

Poor air quality negatively impacts the human respiratory and cardiovascular systems.

Children with asthma, adults with respiratory and heart conditions or who work outdoors are most at risk.

Missouri has 14 counties with a D or F grade for ozone on the American Lung Association State of the Air 2015 report. Most other counties don't have quality monitors.

Because children breathe more air per unit of body weight, children experience greater proportionate exposure than adults to air pollution



**Air pollution has been shown to affect
mental health and cognitive ability,
particularly in children.**

Source: A. Oudin, et al., *BMJ Open*, September 2015
Photo: © 2015 Cheng XueHu - Imaginechina via AP Images

Hebei Province, China

Health Co-Benefits of Carbon Standards for Existing Power Plants: Electricity Sector Improvements Scenario

(Harvard, Boston, Syracuse Universities)

If Implemented in the United States, in 2020 (compared to business as usual)

Lives saved per year (premature deaths) = 3500

Hospitalizations prevented per year = 1000

Heart attacks prevented per year = 220

October 13, 2014

U.S. Department of Defense

2014 Climate Change Adaptation Roadmap

Climate change

“will likely lead to

food and water shortages,

pandemic disease,

disputes over refugees and resources,

and destruction by natural disasters in

regions across the globe.”

The regions most at risk of becoming uninhabitable due to the combination of heat and humidity are:

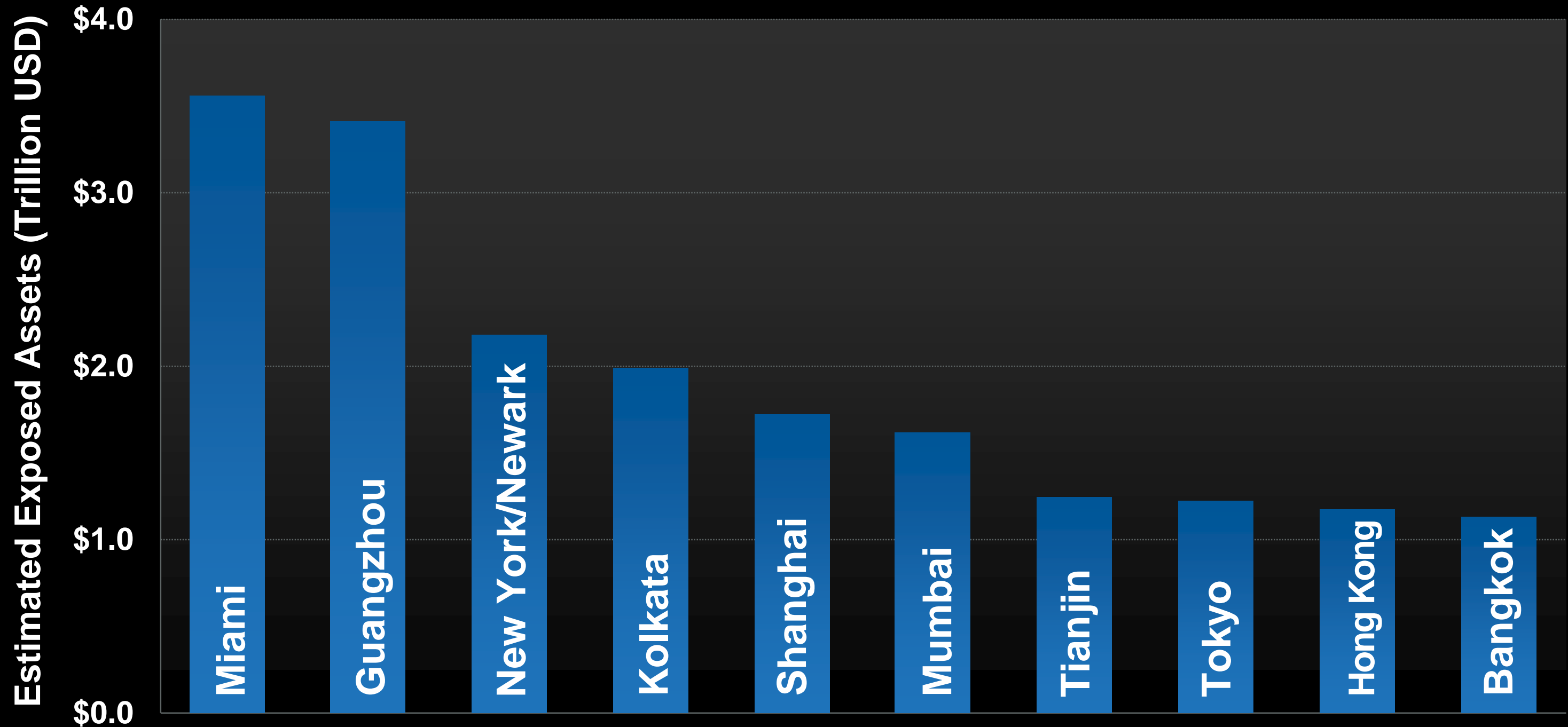
**The Persian
Gulf**

**Northern
India**

**Eastern
China**

Top 10 Cities at Risk from Sea Level Rise in 2070

By Assets at Risk



How will countries cope with over 80 million climate refugees?



The Cost of Carbon

\$ *Political Instability*

\$ *Floods & Mudslides*

\$ *Wildfires*

\$ *Drought*

\$ *Storm Damage*

\$ *Ocean Acidification*

\$ *Infrastructure Loss*

\$ *Climate Refugees*

\$ *Species Extinction*

\$ *Melting Glaciers*

\$ *Famine*

\$ *Water Scarcity*

\$ *Ecosystem Loss*

\$ *Our Way of Life*

\$ *Infectious Diseases*

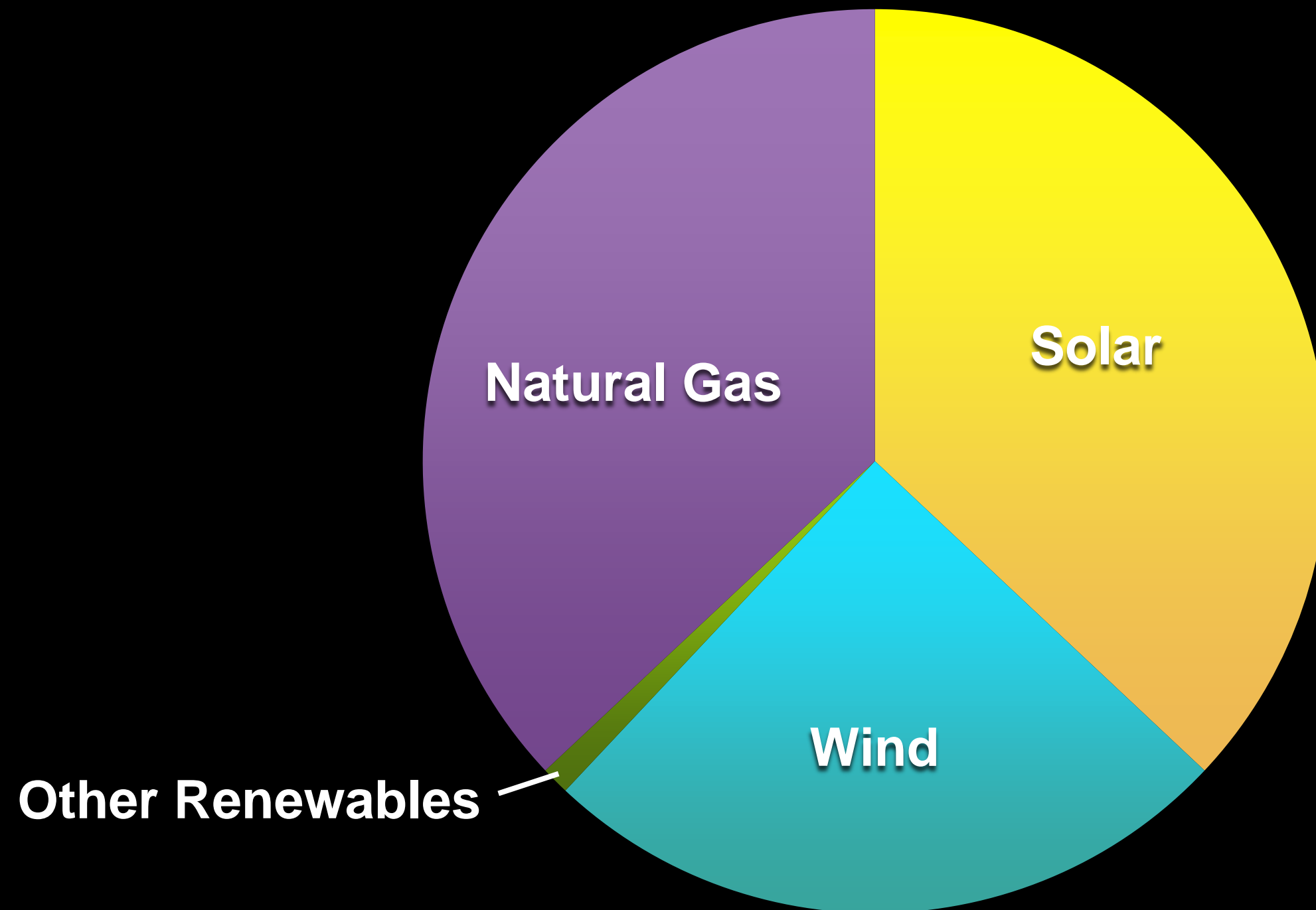
\$ *Sea Level Rise*



... And much, much more
“The #1 Threat to the
Global Economy”

**We have
the solutions
at hand...**

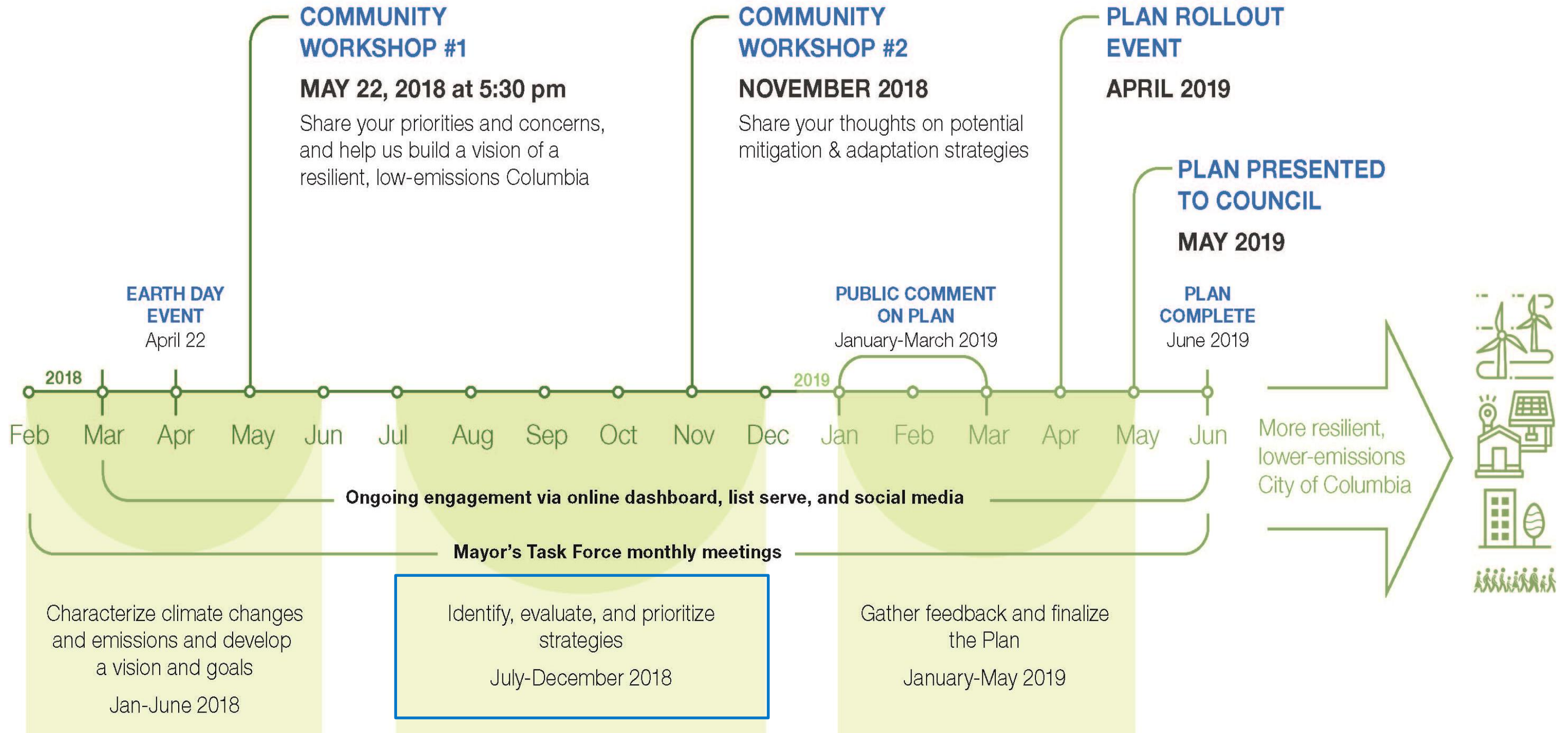
New Electricity Capacity in the U.S., 2017



62% of new capacity was from solar and wind.

COLUMBIA CLIMATE ACTION AND ADAPTATION PLANNING PROCESS

<https://como.gov/sustainability/climate-action>



Input Gathering:

Community Survey
Complete by Nov. 12
<http://bit.ly/CoMoCAAP>

Save the date
Public Meeting
November 28, 2018
5:30 PM – 7:30 PM
Location: City Hall