



2023 AMSUS Annual Meeting  
“Healthcare Collaboration:  
Meeting the Challenges of Today and Tomorrow”  
13-16 February Gaylord National Resort Convention Center

# Health Impacts of Climate Change-Are We Prepared for the Effect on Readiness?

*Moderator* – **Major General (Ret.) Lee Payne**, MD, MBA, Deloitte Consulting Specialist Executive

*Speaker* – **Jay Lemery**, MD, Professor of Emergency Medicine, Chief, Section of Wilderness and Environmental Medicine, co-founder of the University of Colorado School of Medicine's Program on Climate & Health, inaugural Endowed Chair in Climate Medicine

*Panelists* –

- **Major General Paul Friedrichs**, Joint Staff Surgeon
- **LCDR Sherleen Espinosa**, Director, Health Security Cooperation/Global Health, MSC, USN
- **CDR Ian W. Sutherland**, Officer in Charge, US Navy Entomology Center of Excellence
- **Dr. Steven Cersovsky**, Deputy Director, DCPH-Aberdeen, Defense Health Agency
- **Lt Col Paul Kim**, Air Force Medical Service, Chief, Public Health Programs

# Disclosure

- Jay Lemery MD is employed by the University of Colorado School of Medicine and receives grant/research support from the DoD, NASA, the National Science Foundation and the Denver-based Climate & Health Foundation.
- Disclosure will be made when a product is discussed for an unapproved use.
- This continuing education activity is managed and accredited by AffinityCE in collaboration with AMSUS. AffinityCE and AMSUS staff as well as Planners and Reviewers, have no other relevant financial or non-financial interests to disclose.
- Commercial Support was not received for this activity.

# Learning Outcomes

At the conclusion of this activity, participants will be able to:

1. Understand how climate change impacts health
2. Understand how climate change impacts readiness
3. Understand ways government agencies are taking climate action

# Outline of Speaking Points

1. Climate change in a disease paradigm
2. Health threats and threat multipliers
3. Climate Medicine and risks to health systems
4. Not a green 'cure'

# Impact of Climate Change on Human Health



**Climate Change is a Disease of...**

# Climate Change is a Disease of...

- *Infections...*

# Climate Change is a Disease of...

- *Infections...*
- *Respiratory distress...*

# Climate Change is a Disease of...

- *Infections...*
- *Respiratory distress...*
- *Food insecurity...*

# Climate Change is a Disease of...

- *Infections...*
- *Respiratory distress...*
- *Food insecurity...*
- *Waterborne illness...*

# Climate Change is a Disease of...

- *Infections...*
- *Respiratory distress...*
- *Food insecurity...*
- *Waterborne illness...*
- *Heat stress...*

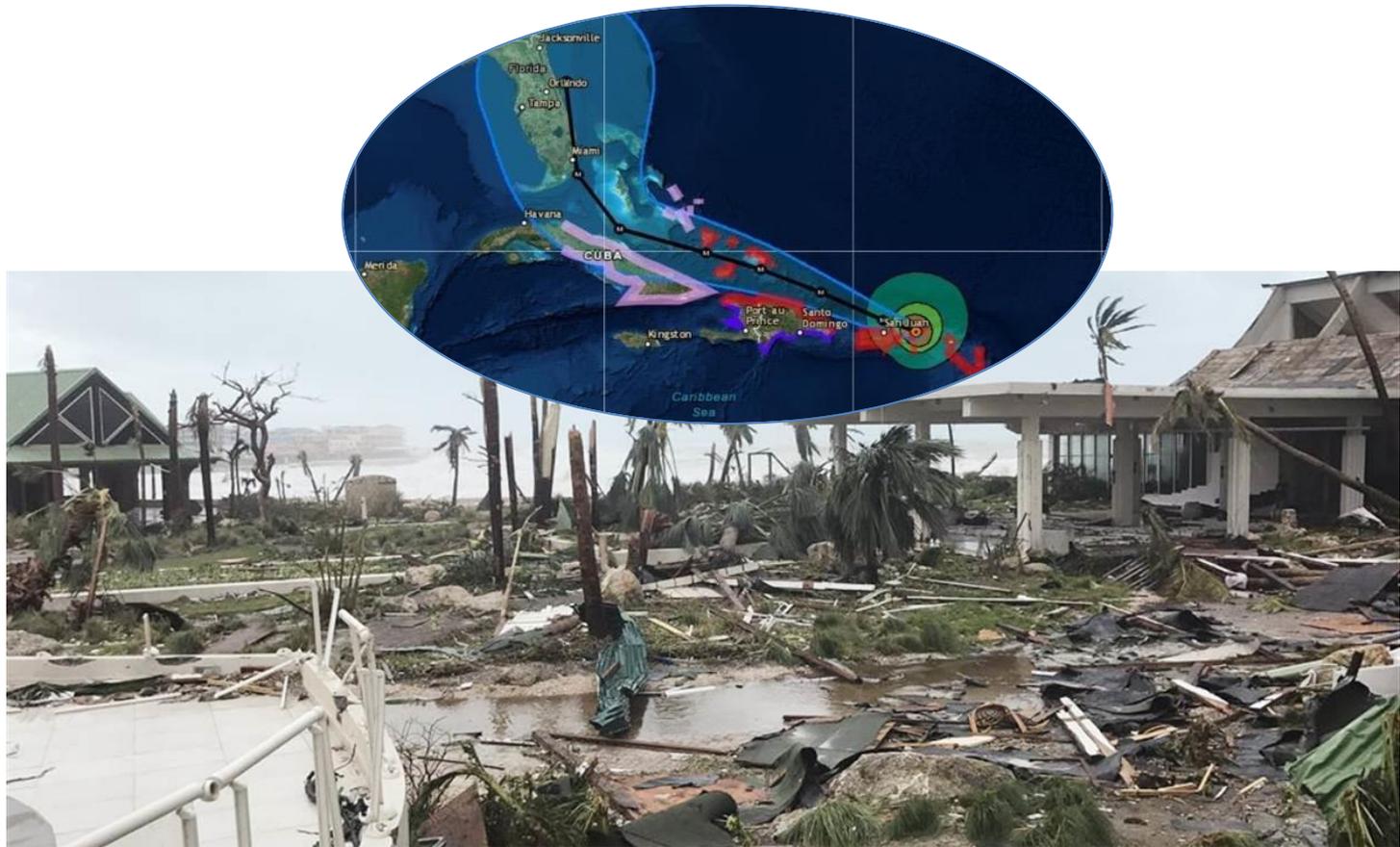
# Climate Change is a Disease of...

- *Infections...*
- *Respiratory distress...*
- *Food insecurity...*
- *Waterborne illness...*
- *Heat stress...*
- *Mental illness...*

# Climate Change is a Disease of...

- *Infections...*
- *Respiratory distress...*
- *Food insecurity...*
- *Waterborne illness...*
- *Heat stress...*
- *Mental illness...*
- *Displacement & trauma...*

# Puerto Rico



# Houston



# California



# Climate Change is a Disease of...

*1. Vulnerability*

# Climate Change is a Disease of...

1. *Vulnerability*
2. *Disasters*

# Climate Change is a Disease of...

1. *Vulnerability*
2. *Disasters*
3. *Ineffective communication*

# Climate Change is a Disease of...

1. *Vulnerability*
2. *Disasters*
3. *Ineffective communication*
4. *Systems failures*

# Climate Change is a Disease of...

1. *Vulnerability*
2. *Disasters*
3. *Ineffective communication*
4. *Systems failures*
5. ***Underinformed leadership***

# Health Effects



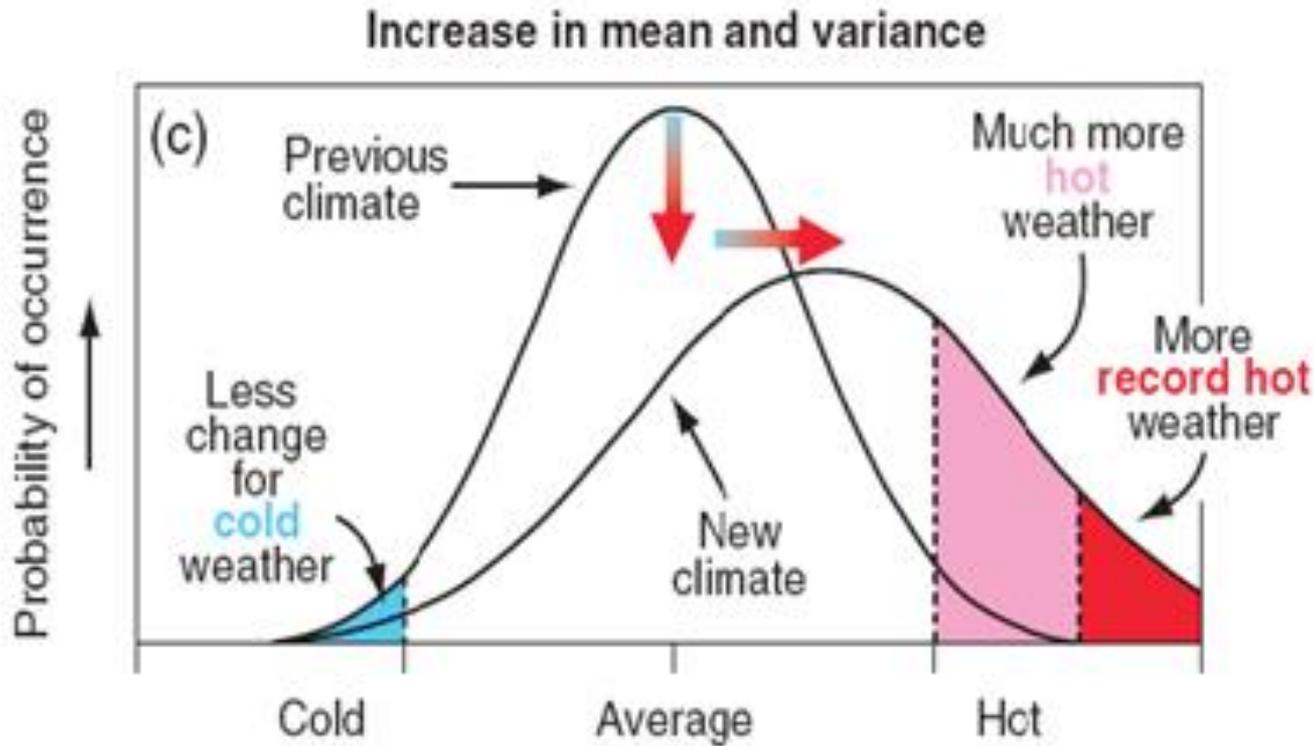
# Health Effects

Until mid-century= **exacerbating health problems that already exist**  
(*very high confidence*)

Throughout the 21st century= **increases in ill-health** in many regions...

***especially in developing countries*** with low income, compared to  
baseline (*high confidence*)

# Increase in the frequency of extreme weather

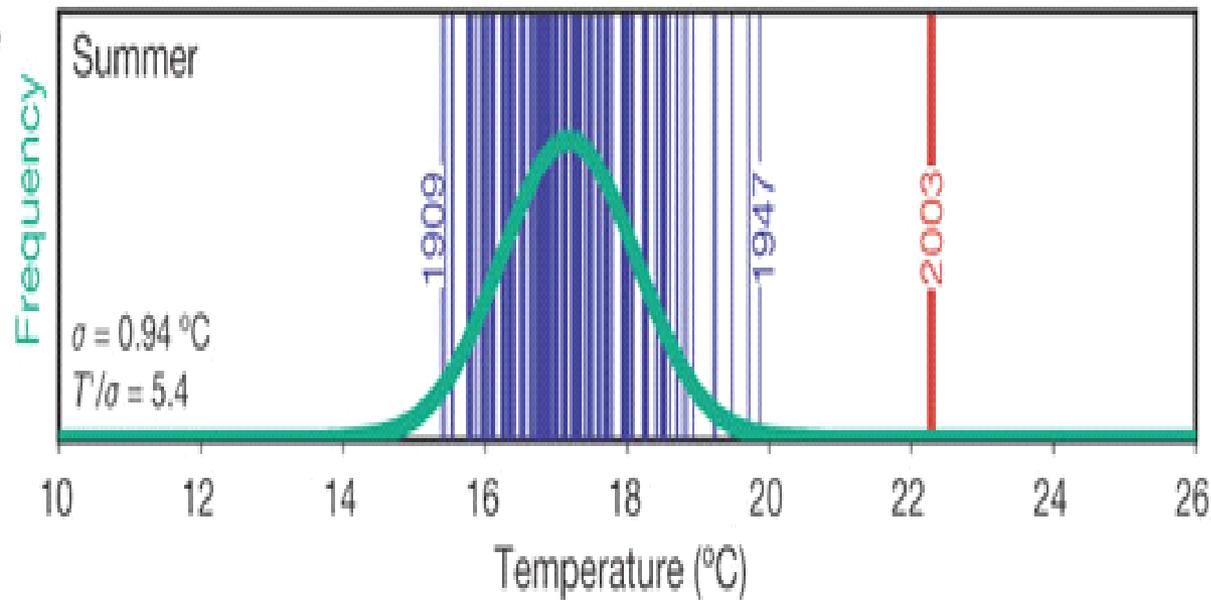


Not only changes in Mean (temp & precip)

But also increases in Extremes

# Some Extreme Events will be well beyond historical experience

## European Heat Wave of 2003



## Confirmed Mortality

UK	2,091
Italy	3,134
France	14,802
Portugal	1,854
Spain	4,151
Switzerland	975
Netherlands	1,400-2,200
Germany	1,410
<b>TOTAL</b>	<b>29,817-30,617</b>

Haines et al. *Public Health* 2006;120:585-96.

Vandentorren et al. *Am J Public Health* 2004; 94(9):1518-20.

## Heat, Heat Waves, and Hospital Admissions among the Elderly in the United States, 1992–2006

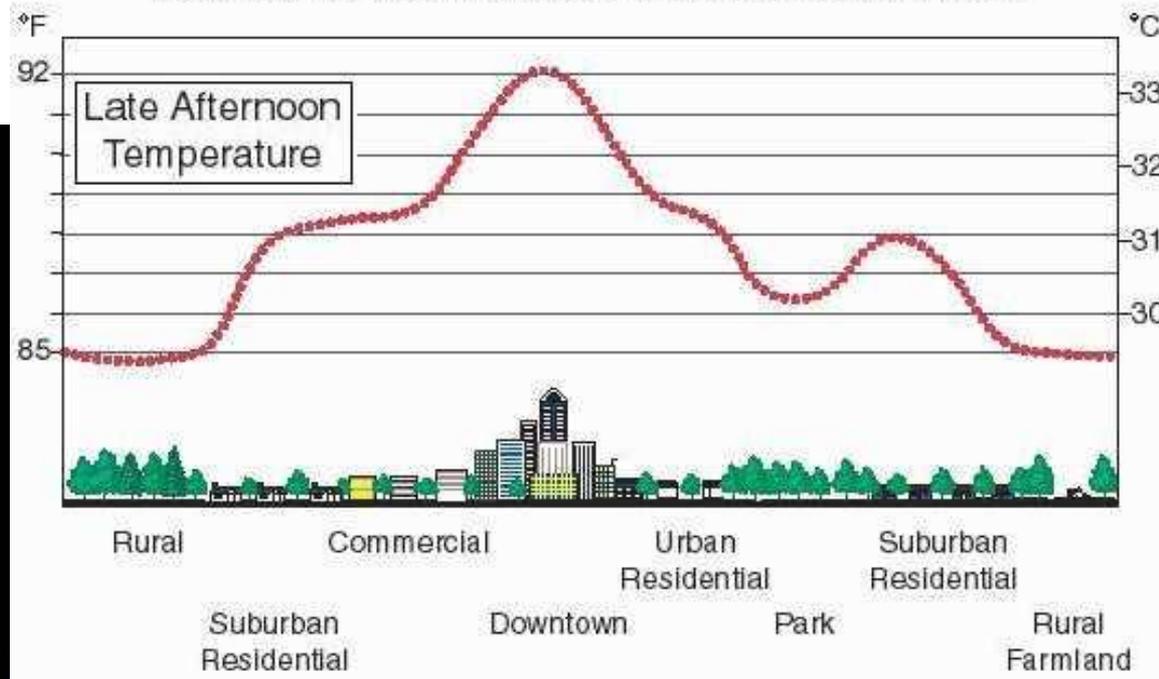
*Carina J. Gronlund,<sup>1</sup> Antonella Zanobetti,<sup>2</sup> Joel D. Schwartz,<sup>2</sup> Gregory A. Wellenius,<sup>3</sup> and Marie S. O'Neill<sup>1,4,5</sup>*

<sup>1</sup>Department of Environmental Health Sciences, University of Michigan School of Public Health, Ann Arbor, Michigan, USA; <sup>2</sup>Department of Environmental Health, Harvard School of Public Health, Boston, Massachusetts, USA; <sup>3</sup>Department of Epidemiology, Brown University, Providence, Rhode Island, USA; <sup>4</sup>Department of Epidemiology, and <sup>5</sup>Risk Science Center, University of Michigan School of Public Health, Ann Arbor, Michigan, USA

3.7 million chronically ill people over age 65 living in 135 U.S. cities.

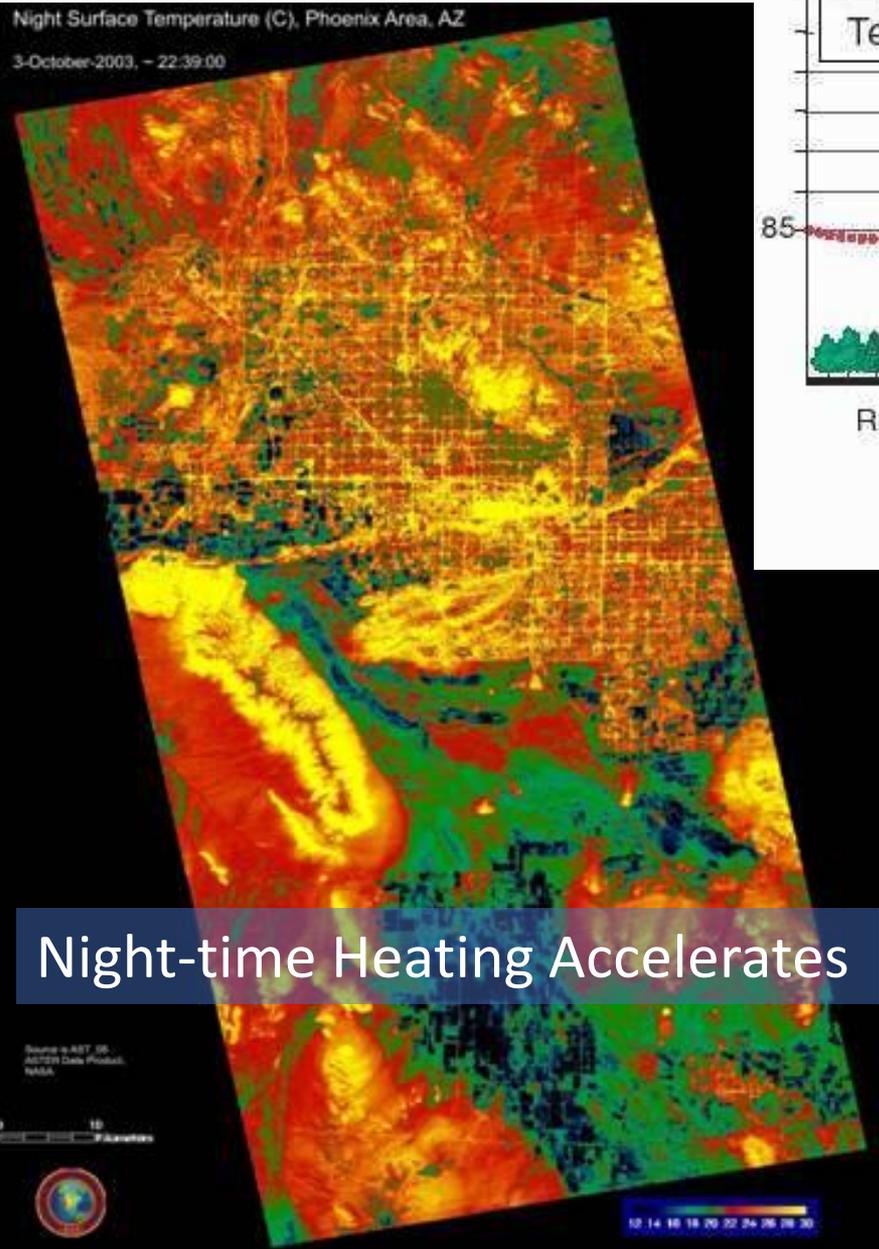
- Each **1°C increase in summer temperature** variability **increased the death rate** for elderly with chronic conditions between **2.8% and 4.0%** depending on the condition.
- **4.0%** for those with **diabetes**;
- **3.8%** for those who'd had a **previous heart attack**;
- **3.7%** for those with **chronic lung disease**;
- **2.8%** for those with **heart failure**.
- Greater summer temperature variability in the U.S. could result in more than **10,000** additional deaths per year.

# Sketch of an Urban Heat-Island Profile



Night Surface Temperature (C), Phoenix Area, AZ

3-October-2003, - 22:39:00



Night-time Heating Accelerates

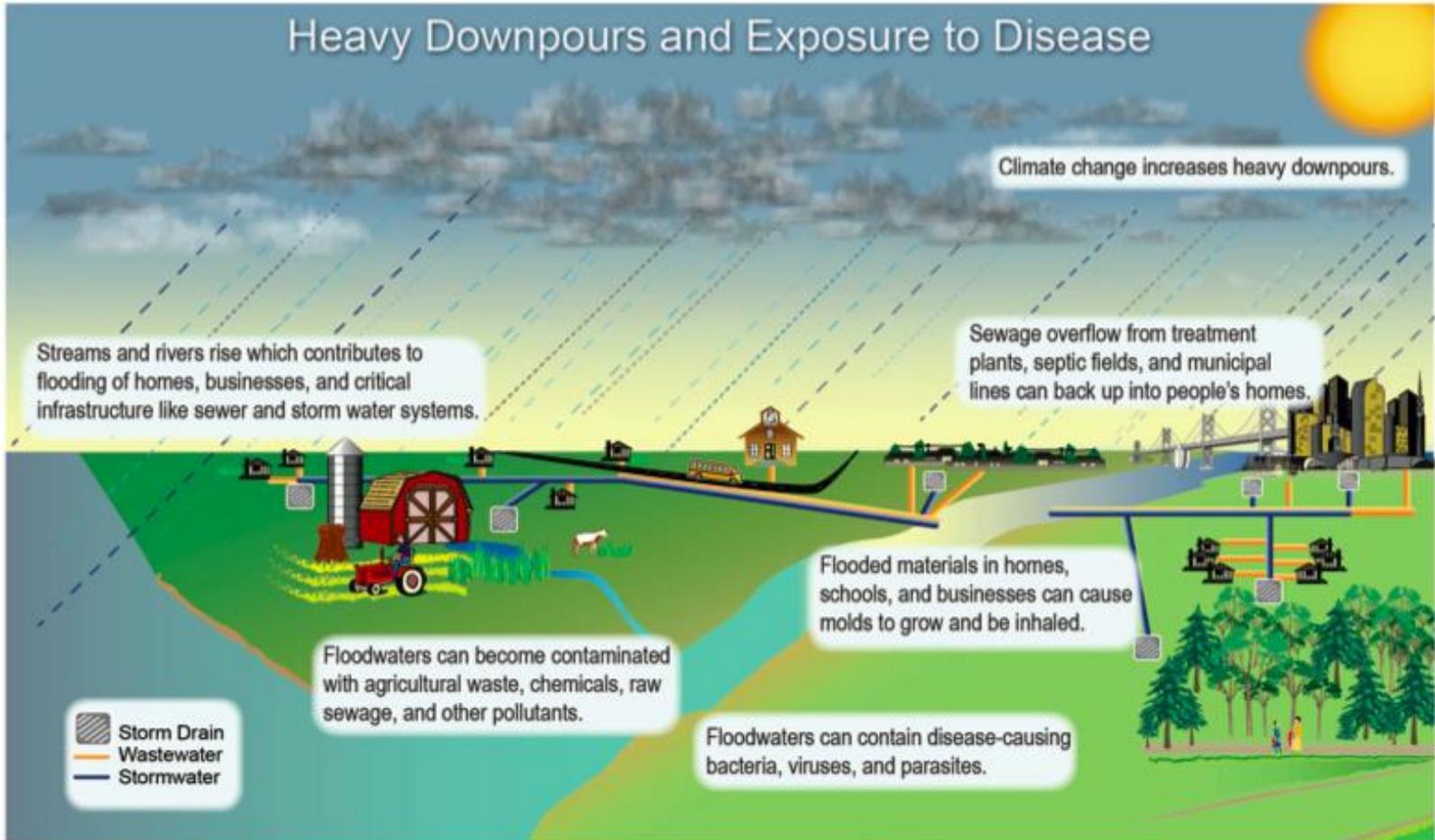
Urban Heat Island  
can add 7° – 12° F

Thermal Satellite Image of  
Phoenix, AZ Night Surface  
Temperature





# Heavy Downpours and Exposure to Disease



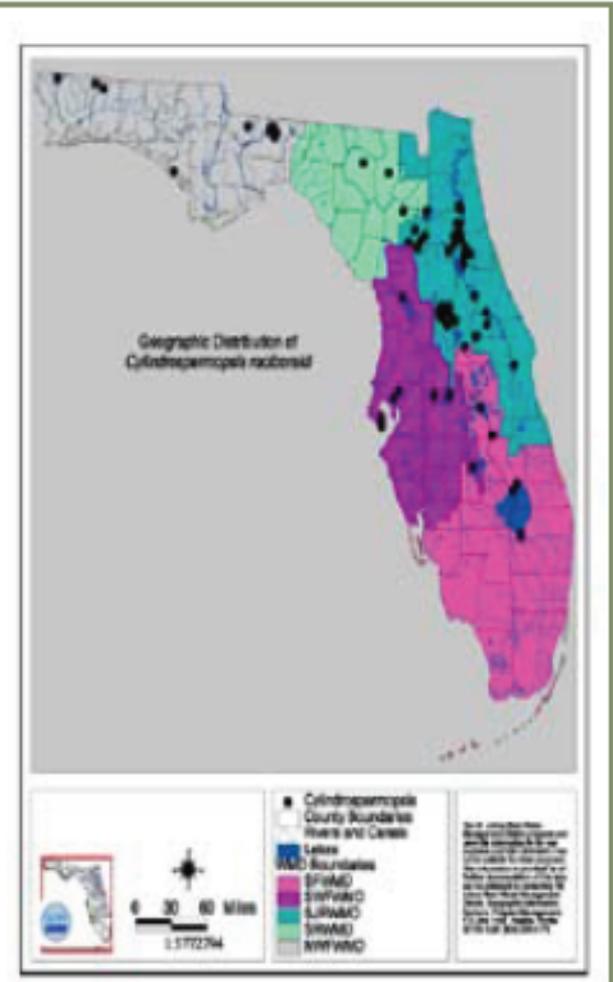
# Harmful Algal Blooms (Red-tides)

Enhanced by:

- Increased water temps
- Nutrient runoff
- Upwelling events



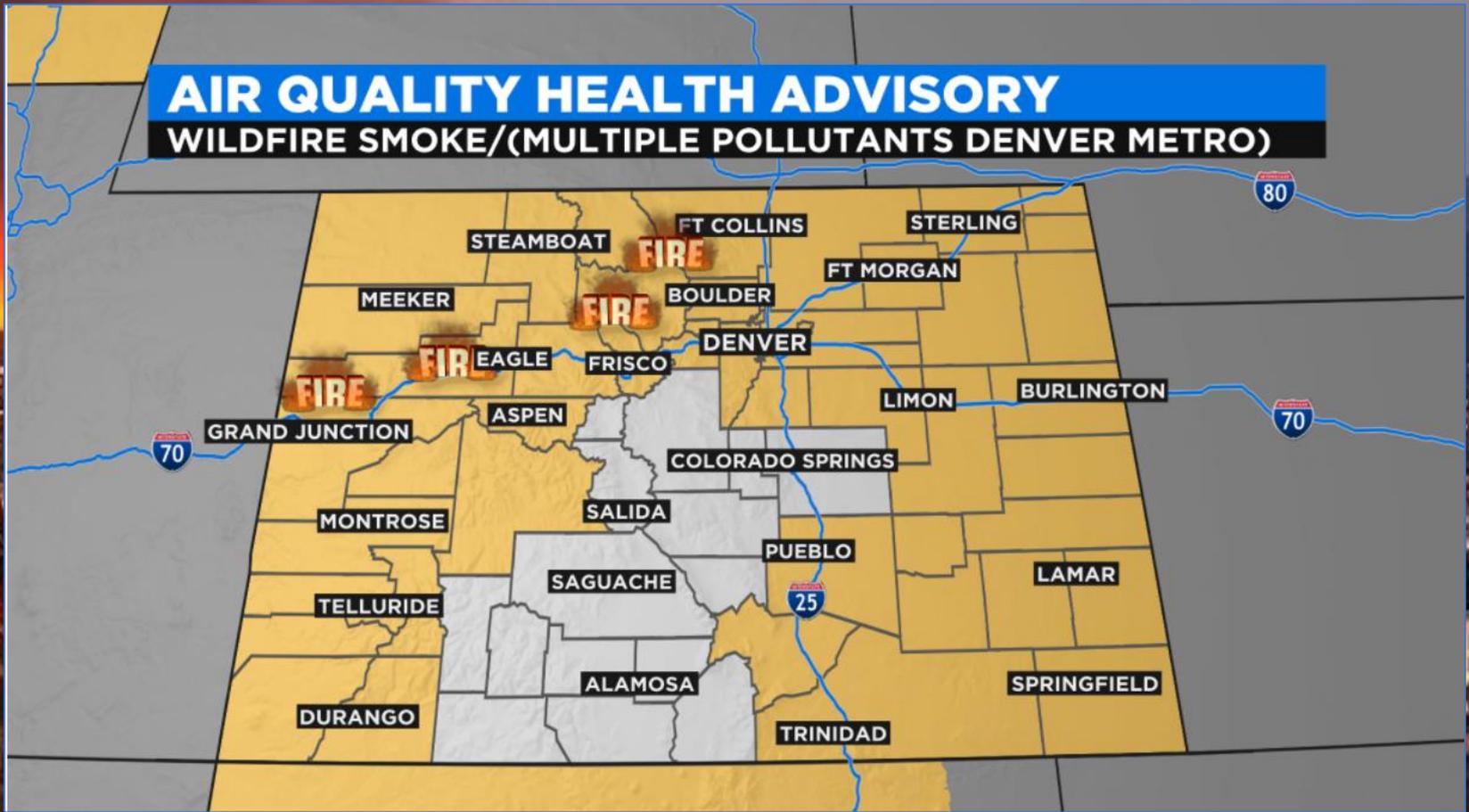
Figure 2. Distribution of the CyanoHAB, *Cylindrospermopsis raciborskii*, in Florida (Williams 2001, Fristachi et al. 2007). *C. raciborskii*, which produces potent hepatotoxins (Table 2), was originally found only in tropical areas but has recently spread to cooler regions.





# AIR QUALITY HEALTH ADVISORY

WILDFIRE SMOKE/(MULTIPLE POLLUTANTS DENVER METRO)



## BEFORE 1970

Cold temperatures caused freezing at high elevations and limited mosquitoes, mosquito-borne diseases and many plants to low altitudes

## TODAY

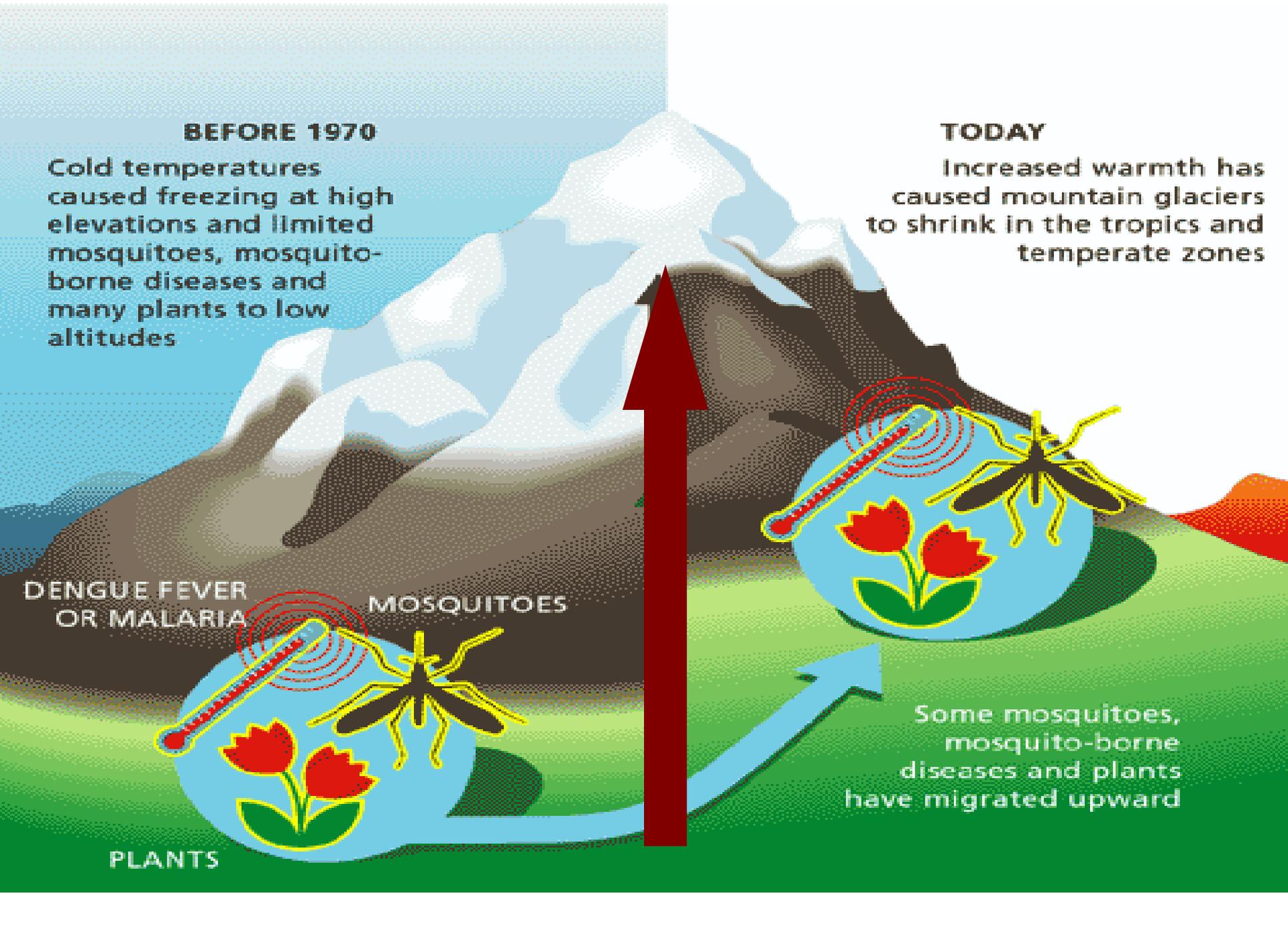
Increased warmth has caused mountain glaciers to shrink in the tropics and temperate zones

DENGUE FEVER  
OR MALARIA

MOSQUITOES

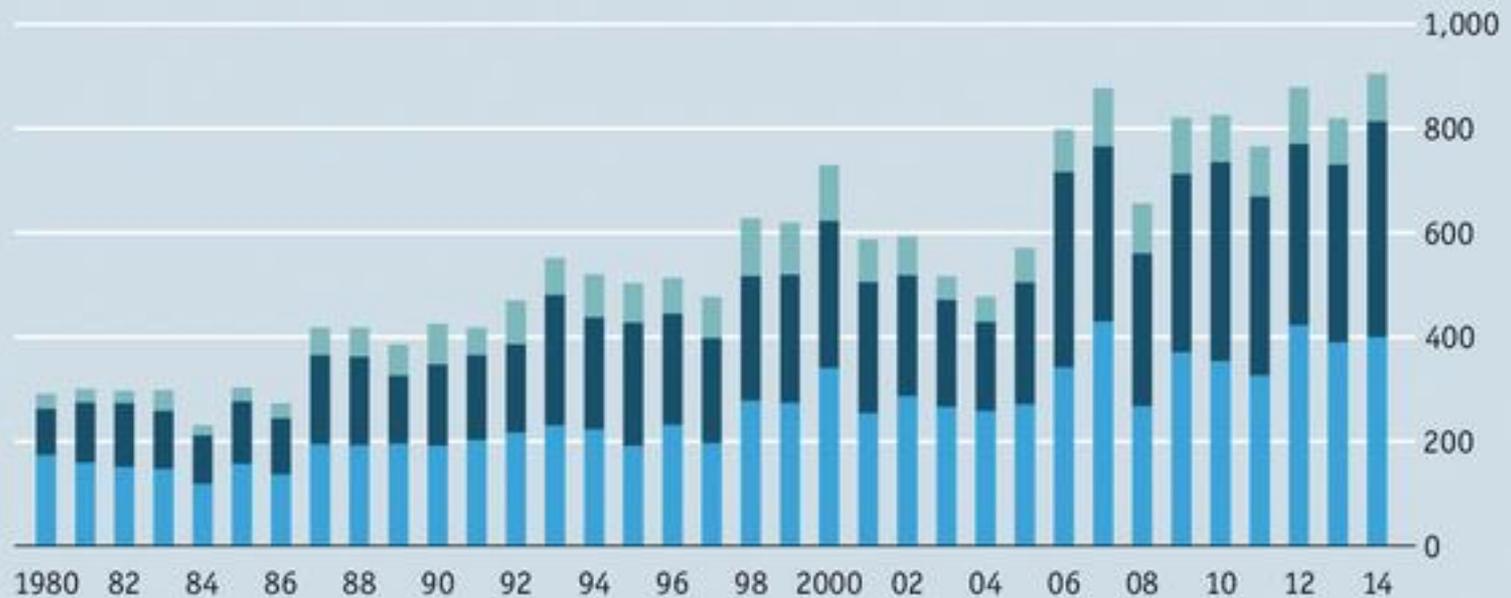
PLANTS

Some mosquitoes,  
mosquito-borne  
diseases and plants  
have migrated upward



## Disasters caused by weather and climate

■ Meteorological events (*Storms*)   ■ Hydrological events (*Floods, landslides and avalanches*)  
■ Climatological events (*Extreme temperatures, droughts, forest fires*)



Source: Munich Re



October 2012:

Hurricane Sandy swept through the Caribbean and Atlantic, at its peak covering more than 1,000 miles of the North American coastline— the **largest storm system in recorded history.**

>250 people lost their lives during the storm

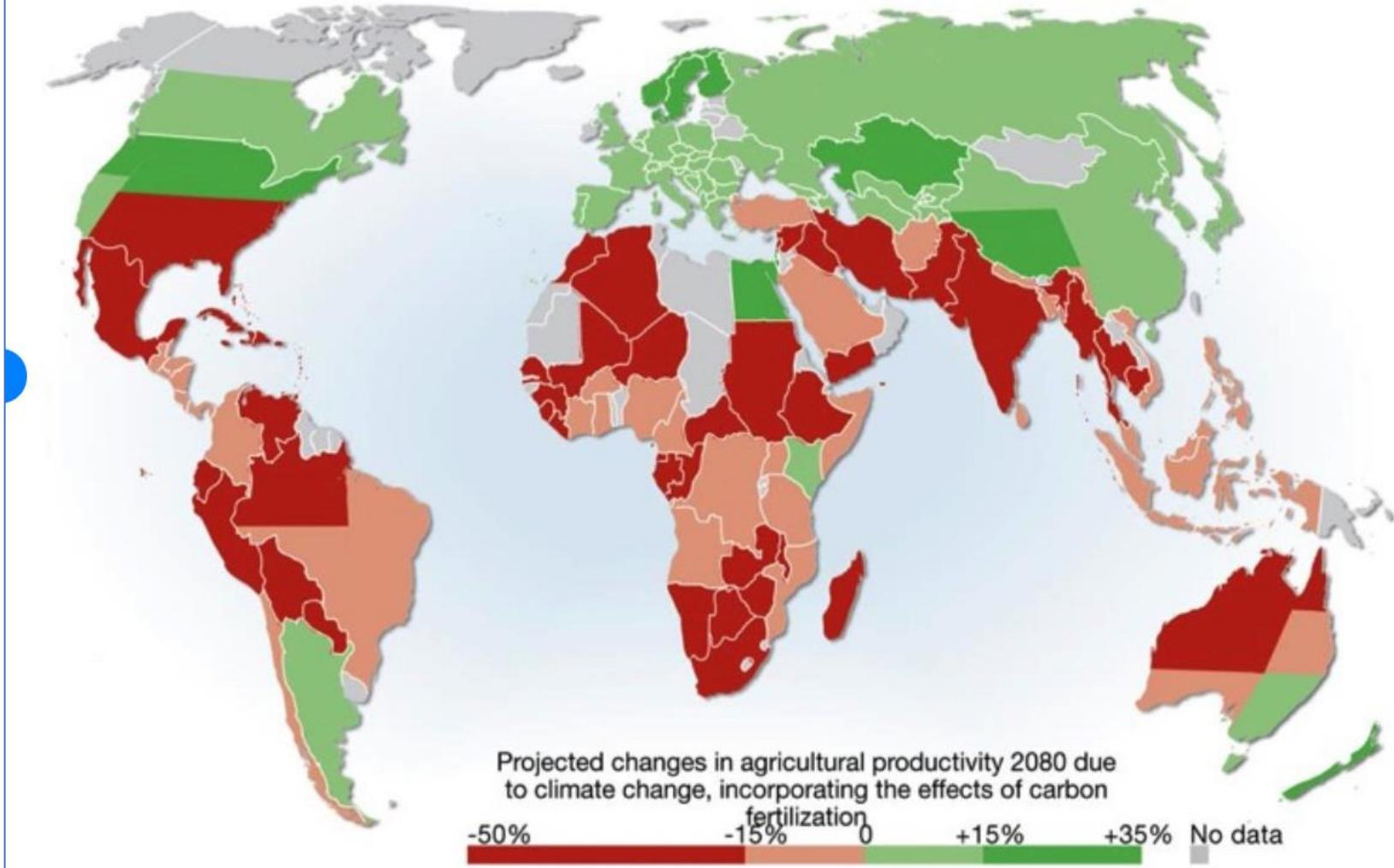


>\$65 billion in immediate damage





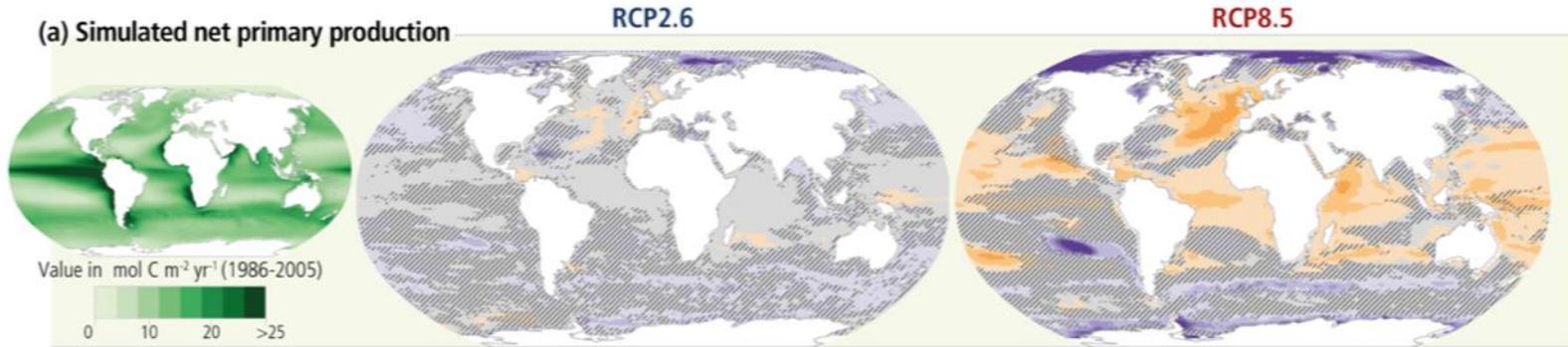
**Projected changes in agricultural productivity 2080 due to climate change, incorporating the effects of carbon fertilization (Ahlenius, 2009)**



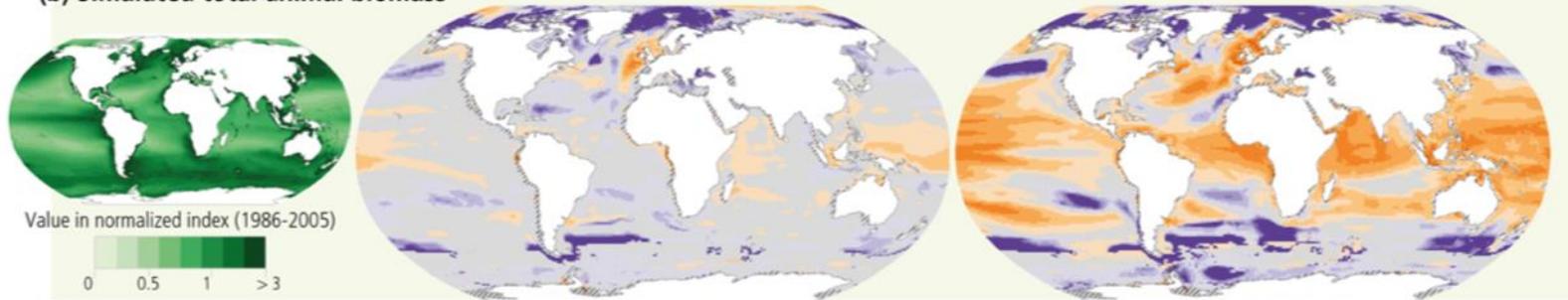
– Projected changes in agricultural productivity 2080 due to climate change

# Projected changes, impacts and risks for ocean ecosystems as a result of climate change

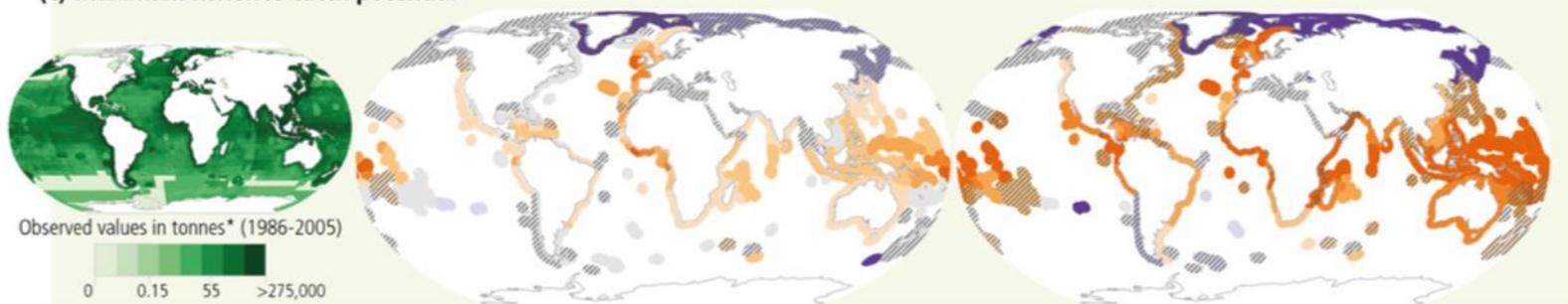
(a) Simulated net primary production



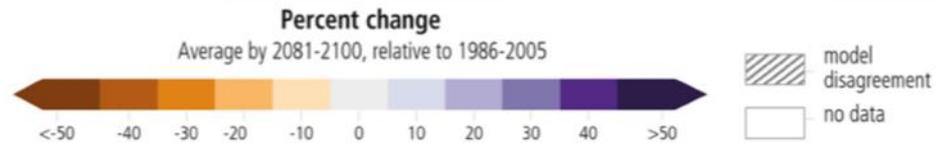
(b) Simulated total animal biomass



(c) Maximum fisheries catch potential

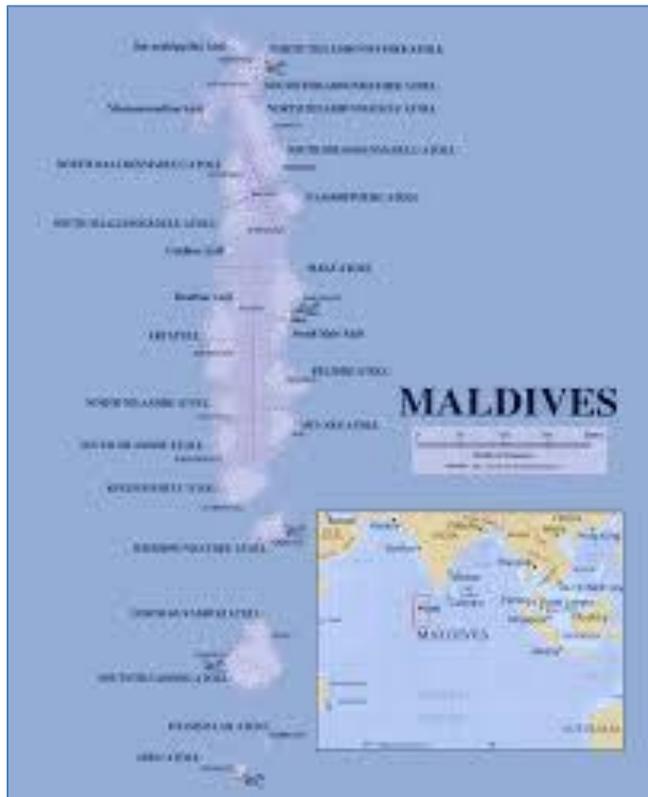


\* See figure caption for details



**Climate change over the 21<sup>st</sup> century is projected to increase displacement of people** *(medium evidence, high agreement)*.

# By 2050: 75 million Islanders will be forced to relocate



Climate change can indirectly increase risks of violent conflicts in the form of **civil war and inter-group violence**

Amplifying **poverty and economic shocks** (*medium confidence*).



**Journal of Geophysical Research: Atmospheres**

**RESEARCH ARTICLE**      **Spatiotemporal drought variability in the Mediterranean over the last 900 years**

10.1002/2015JD023929

**Key Points:**  
• There is large multidecadal drought

**Benjamin I. Cook<sup>1,2</sup>, Kevin J. Anchukaitis<sup>3,4,5</sup>, Ramzi Touchan<sup>4</sup>, David M. Meko<sup>4</sup>, and Edward R. Cook<sup>5</sup>**

***The rich will find their world to be more expensive,  
inconvenient, uncomfortable, disrupted and colorless —  
in general, more unpleasant and unpredictable,  
perhaps greatly so...***

***The poor will die...***

Kirk R. Smith

Professor, Environmental Health Sciences, UC- Berkeley

# Los Angeles Times

## The climate crisis will wreck our health

We need specially trained doctors to treat the harm to people caused by a heating planet.

By Jay Lemery

**O**N MONDAY, THE United Nations' Intergovernmental Panel on Climate Change dropped its latest assessment report — an exhaustive and far-reaching inventory of human vulnerabilities to an increasingly inhospitable planet and our strategies to adapt.

The precision with which these data were presented — an accumulation of decades of climate science — reinforces the overwhelming conclusion that our ecosystems

at the table to articulate the health consequences of climate change. Record heat exposures, flooding, wildfires, hurricanes and forced displacement will exacerbate existing health disparities, most predominantly in disadvantaged populations. With the right training and mission, we can create patient-centric policies when working alongside business executives, community leaders and policymakers to advocate for climate action, address environmental justice issues and help health systems reduce carbon emissions.

Here's how climate doctors can lead on smart policy:

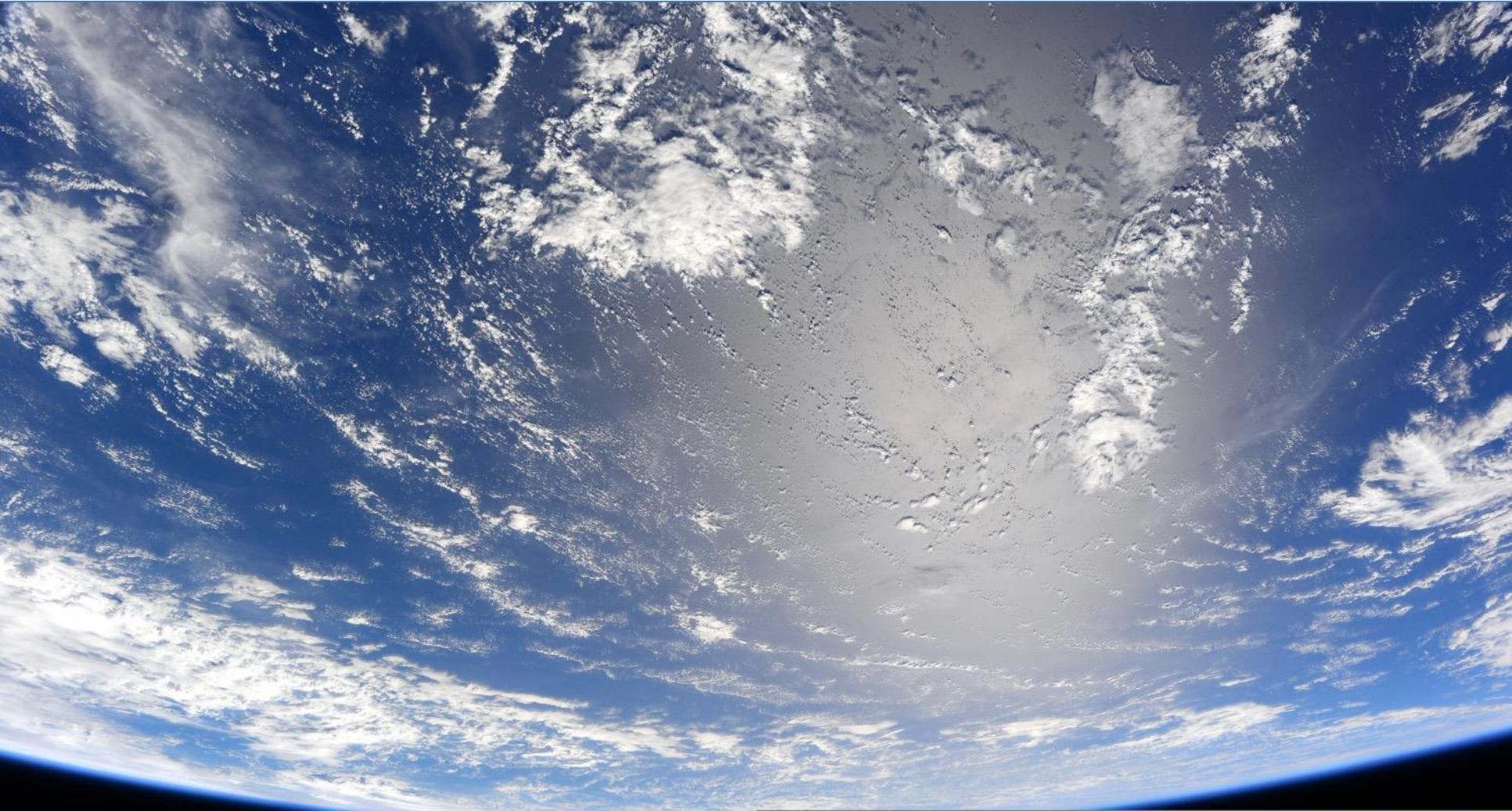
**Education:** We start today, training our medical students in basic connections between climate and health — a topic largely missing from medical education. Medical schools should create fellowships to mold leaders with the policy expertise to build coalitions



BRIAN VAN DER BRUG Los Angeles Times

**EXTREME WEATHER** events such as wildfires are becoming more common thanks to climate change — worsening air quality, exacerbating chronic disease and bringing other health risks.

# Assessing risk, finding solutions





Think Global Health



ENVIRONMENT

# A New Era of Climate Action Calls for Climate Doctors

Educating this generation of physicians in climate resilience is critical



- ***Few who can effectively articulate the dizzy interplay*** between public health, energy policy, geopolitics, earth science, government and medicine
- ***Need a knowledge set to fill that gap and to help craft the narratives and policies to advance health equity & health system resiliency in our post-pandemic world***

## SCIENCE & DIPLOMACY

An online publication from the AAAS Center for Science Diplomacy

# Competencies 101

## **Clinical Core--** What does a physician seeking fluency in climate medicine actually need to know?

Five areas of practice, recommended for all health professionals:

1. Fundamental knowledge of climate drivers and health impacts (adaptation, mitigation, co-benefits)
2. public health services and emergency planning skills
3. clinical practice (diagnosis and management)
4. policy aspects
5. communication

Global Consortium on Climate  
and Health Education

# Deeper dives: additional topics of fluency

It is no underestimation that policy has **stalled** from the **difficulty** in translating complex earth science into **convincing, articulate linkages** between *extreme heat and geopolitical instability; loss of biodiversity and pandemics; or extreme weather and food insecurity.*



# Big Green Data

There is another important shift happening that climate doctors will need to prepare for—the ***plethora of metrics*** from many sources accounting all things climate and health:

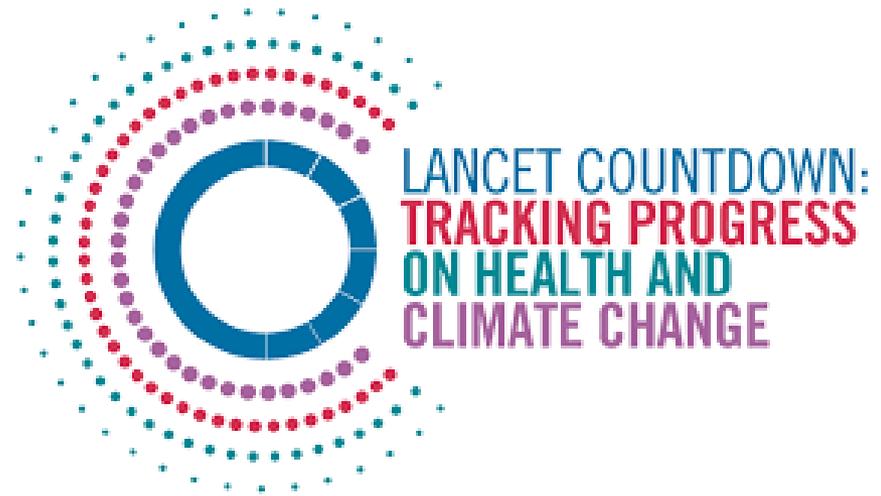
*...earth science, energy use profiles, patient vulnerabilities, expenditures on 'green' initiatives, engagement, and health outcomes.*

# Big Green Data

Multidisciplinary risk assessment of climate & health

The 2021 report = dozens of indicators across five sections: climate change impacts, exposures, and vulnerabilities; adaptation, planning, and resilience for health; mitigation actions and health co-benefits; economics and finance; and public and political engagement.

*Draws on the expertise of climate scientists, geographers, engineers, experts in energy, food, and transport, economists, social, and political scientists, data scientists, public health professionals, and doctors.*



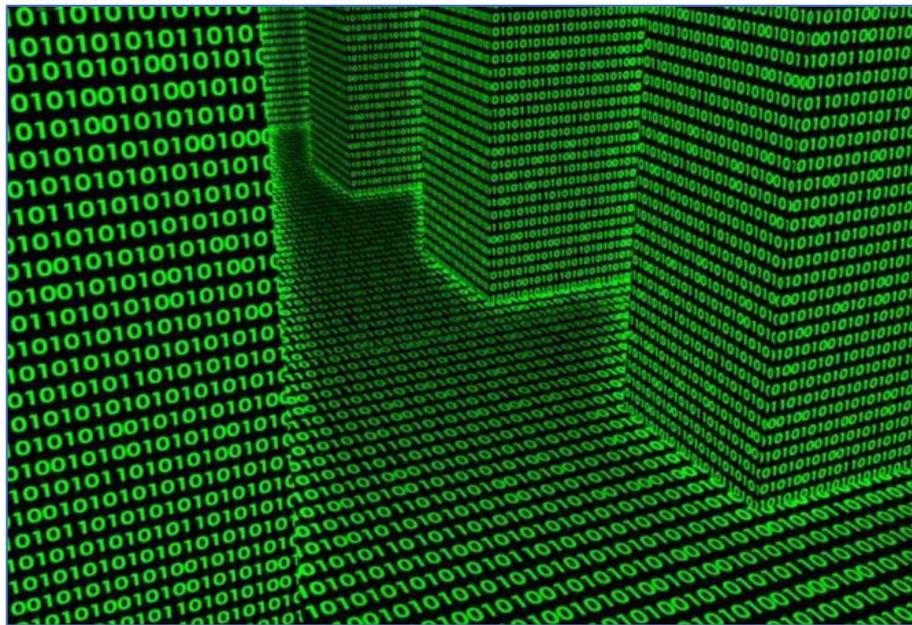
# Big Green Data

- Practice Greenhealth is a 'membership and networking organization for sustainable health care, delivering environmental solutions to hospitals and health systems across the United States'
- *Ability to generate numerous, cross-sector metrics on healthcare sustainability and resiliency*

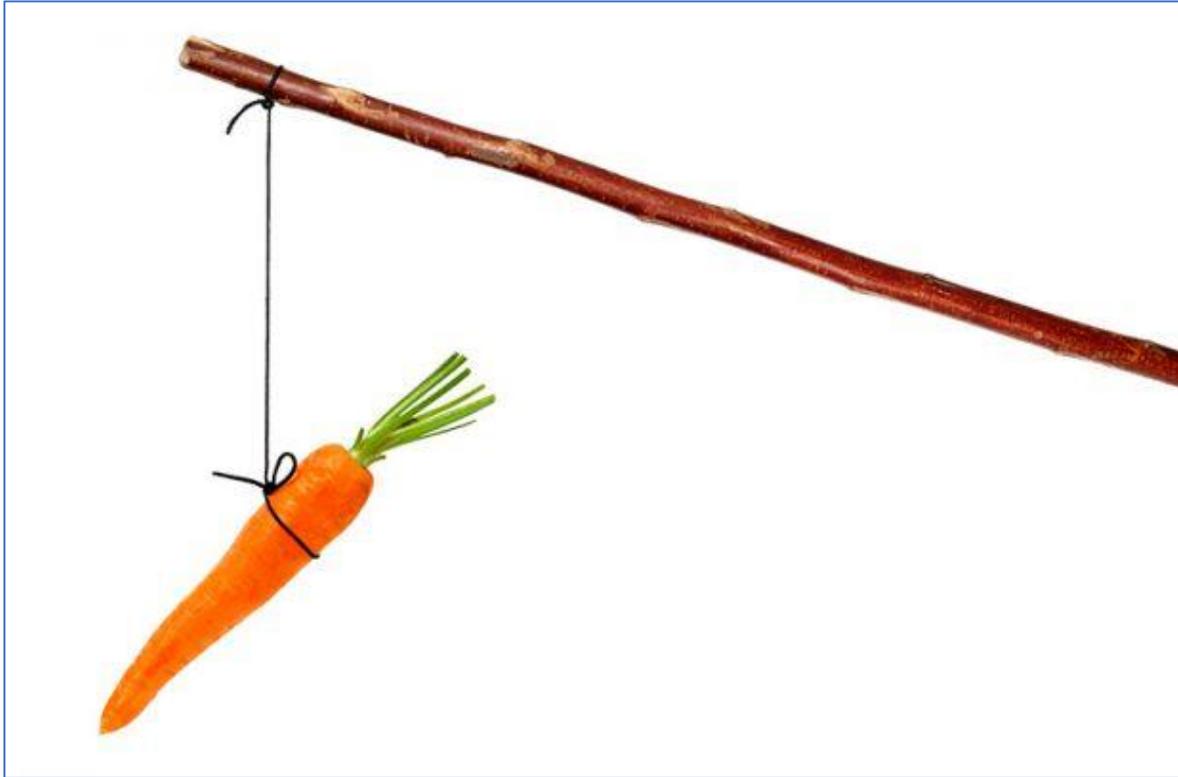


# Big Green Data

*How do we digest these metrics, and lead on clear, convincing strategy on mitigation & adaptation **and still maintain a patient-centric posture** to our systems?*



# Sticks



# Taking Action

*Asked if the office would cut Medicare payments to hospitals that don't reduce their carbon emissions, HHS Secretary Xavier Becerra didn't directly answer but said, '**We're going to try to use every tool at our disposal.**'*



## HHS launches new climate health office | TheHill

The Department of Health and Human Services (HHS) on Monday launched a new office aimed at addressing the health impacts and disparities caused by climate change.

thehill.com

<https://thehill.com/policy/energy-environment/569999-hhs-launches-new-climate-health-office>

# JAMA

## Confronting Health Care's Climate Crisis Conundrum The Federal Government as Catalyst for Change

VIEWPOINT

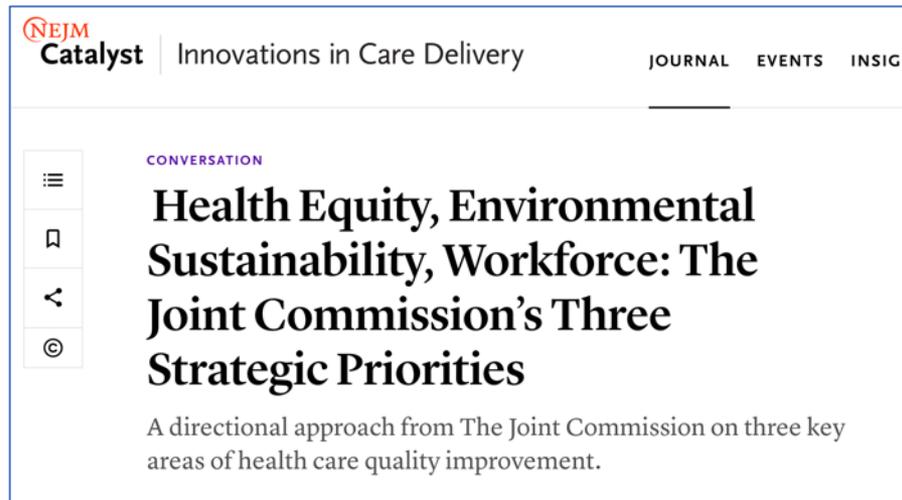
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Kenneth W. Kizer, MD,  
MPH  
Atlas Research, LLC,  
Washington, DC.

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Karl Christine Nadeau,  
MD, PhD  
Stanford University  
School of Medicine,  
Palo Alto, California;  
and Sean Parker Center  
for Allergy Research,  
Palo Alto, California.

*...The federal government should maximally leverage its unique position as a health care service **provider, purchaser, regulator, and sponsor** of research, education, and training...*



10/25/22 Thomas H. Lee, MD, interviews Jonathan B. Perlin MD, President and Chief Executive Officer of The **Joint Commission**.

Climate change is a **health equity issue**, as those with the fewest resources are least able to compensate for its effects.

...a technical advisory panel to accomplish two things. First... encourage[ing] health systems to address **reducing their own carbon footprint**, and second... **review our own standards**....that do not require excess consumption



**COP27, November 2022**

*HHS & the UK's NHS announce cooperation on health system procurement carbon accounting standards*

## How To Claim CE/CME Credit for this meeting

[amsus.cds.pesgce.com](http://amsus.cds.pesgce.com)

## How To Contact Speakers

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