

Climate Change and the Physician: What We Need to Know, What We Need to Do



September, 2024



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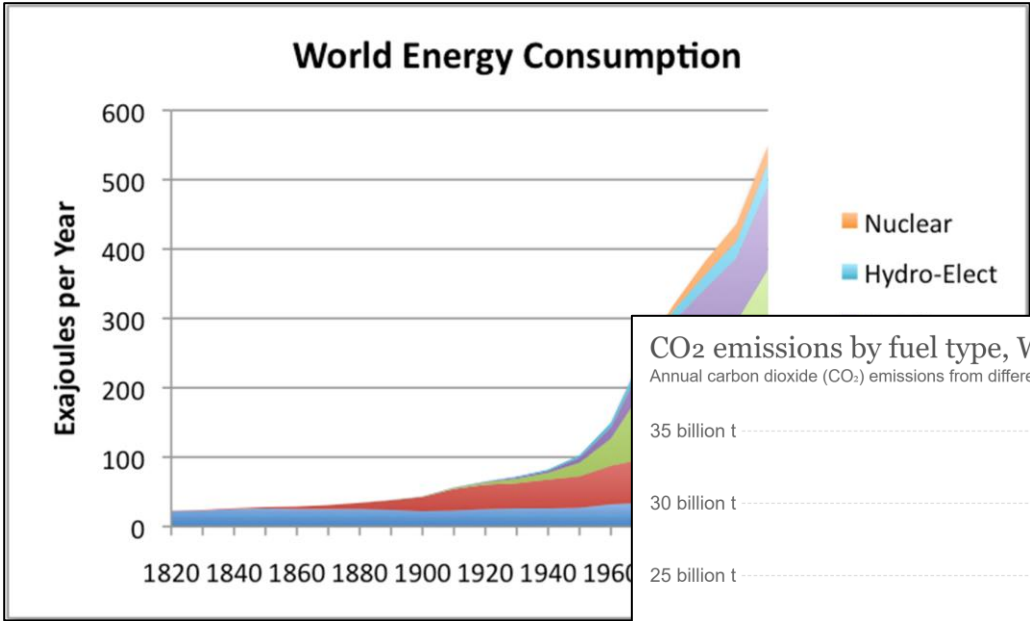


I have no financial conflicts of interest to report. I disclose that I'm a member of advisory boards (or equivalent committees) for the Planetary Health Alliance; the Harvard Center for Climate, Health, and the Global Environment; the Medical Society Consortium on Climate Change and Health; the Global Consortium on Climate and Health Education; the Yale Center on Climate Change and Health; EcoAmerica's Climate for Health program; and the European Centre for Environment and Human Health—all voluntary unpaid positions.

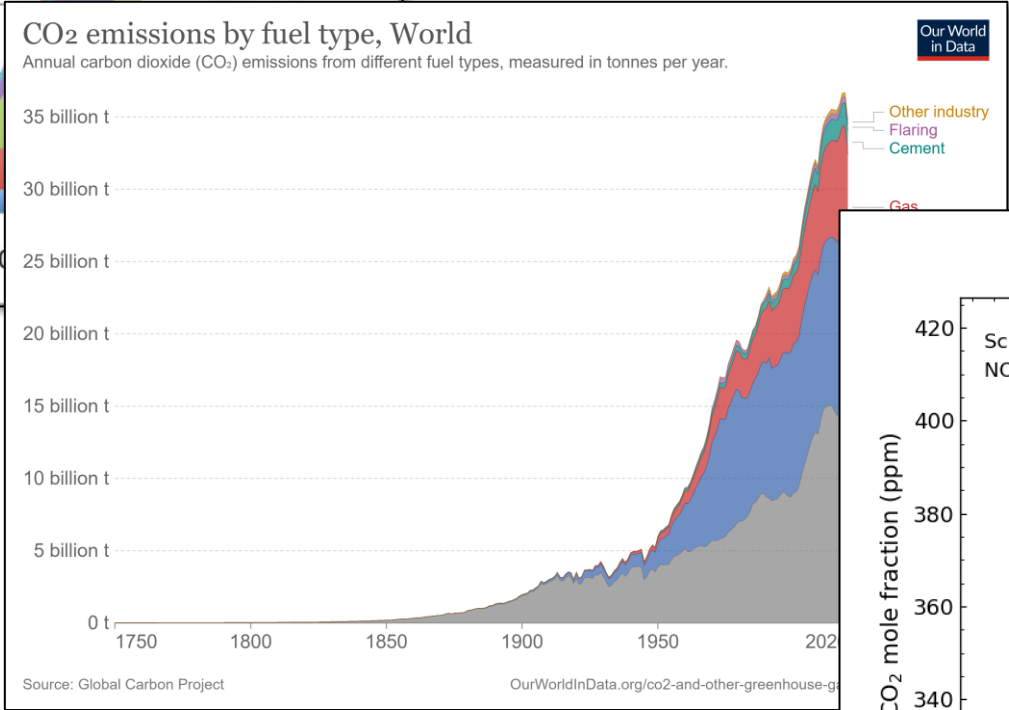




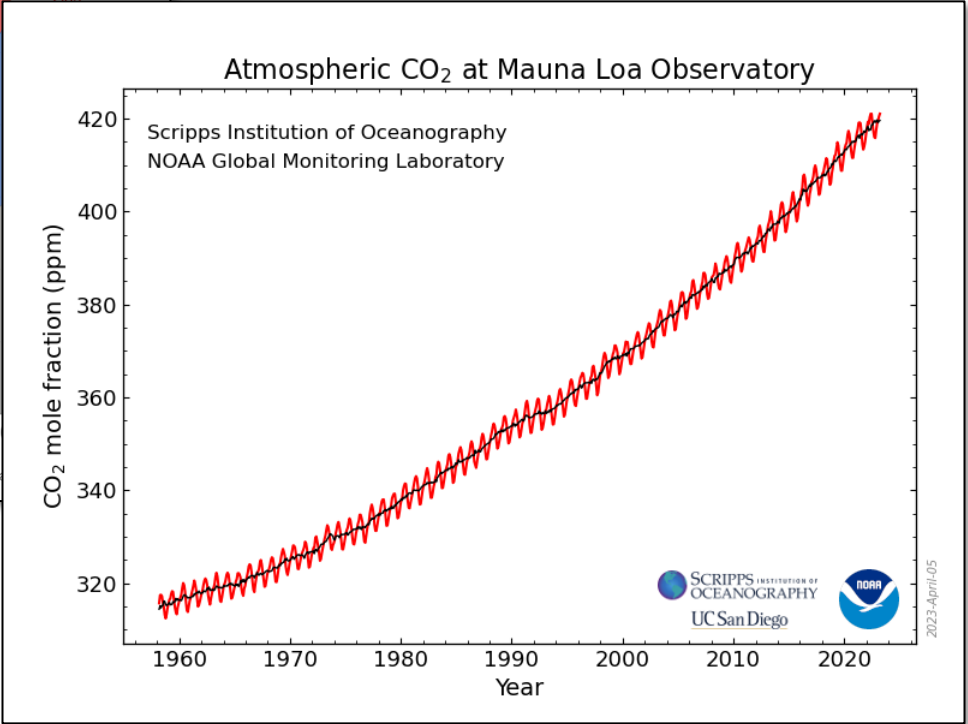
↑ ENERGY USE



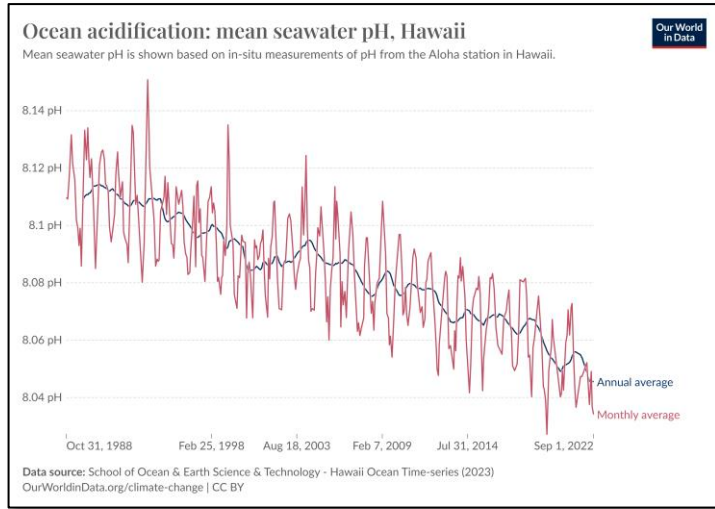
↑ CO₂ EMISSIONS



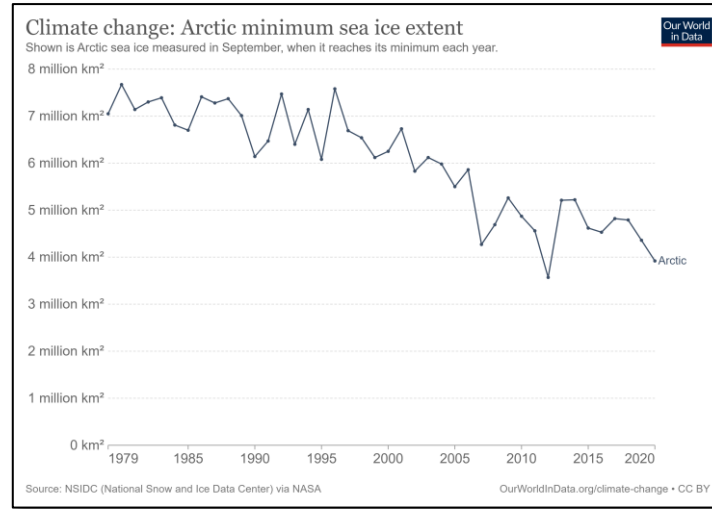
↑ CO₂ CONCENTRATION



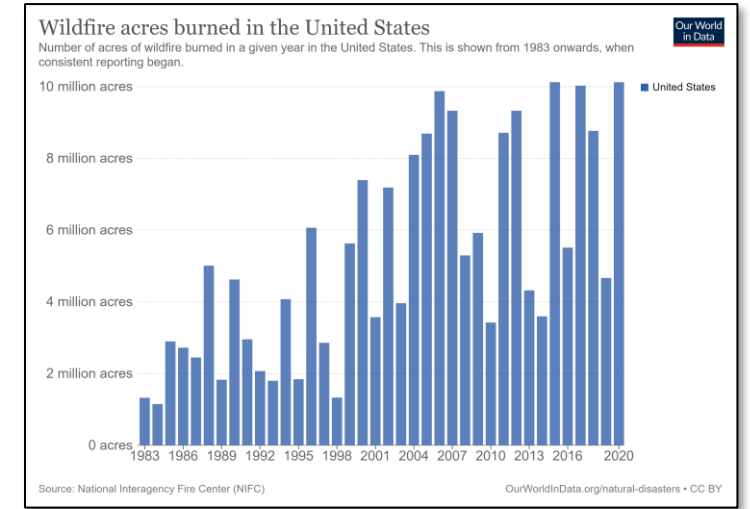
OCEAN ACIDIFICATION



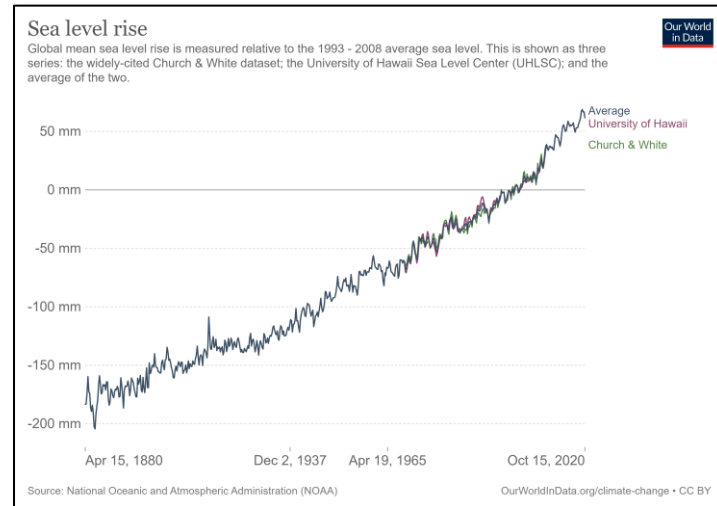
ARCTIC SEA ICE



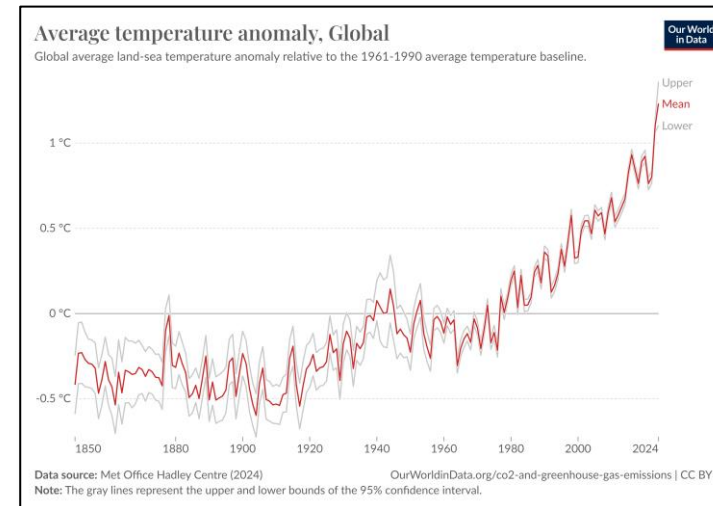
WILDFIRE ACRES BURNED (U.S.)



SEA LEVEL RISE

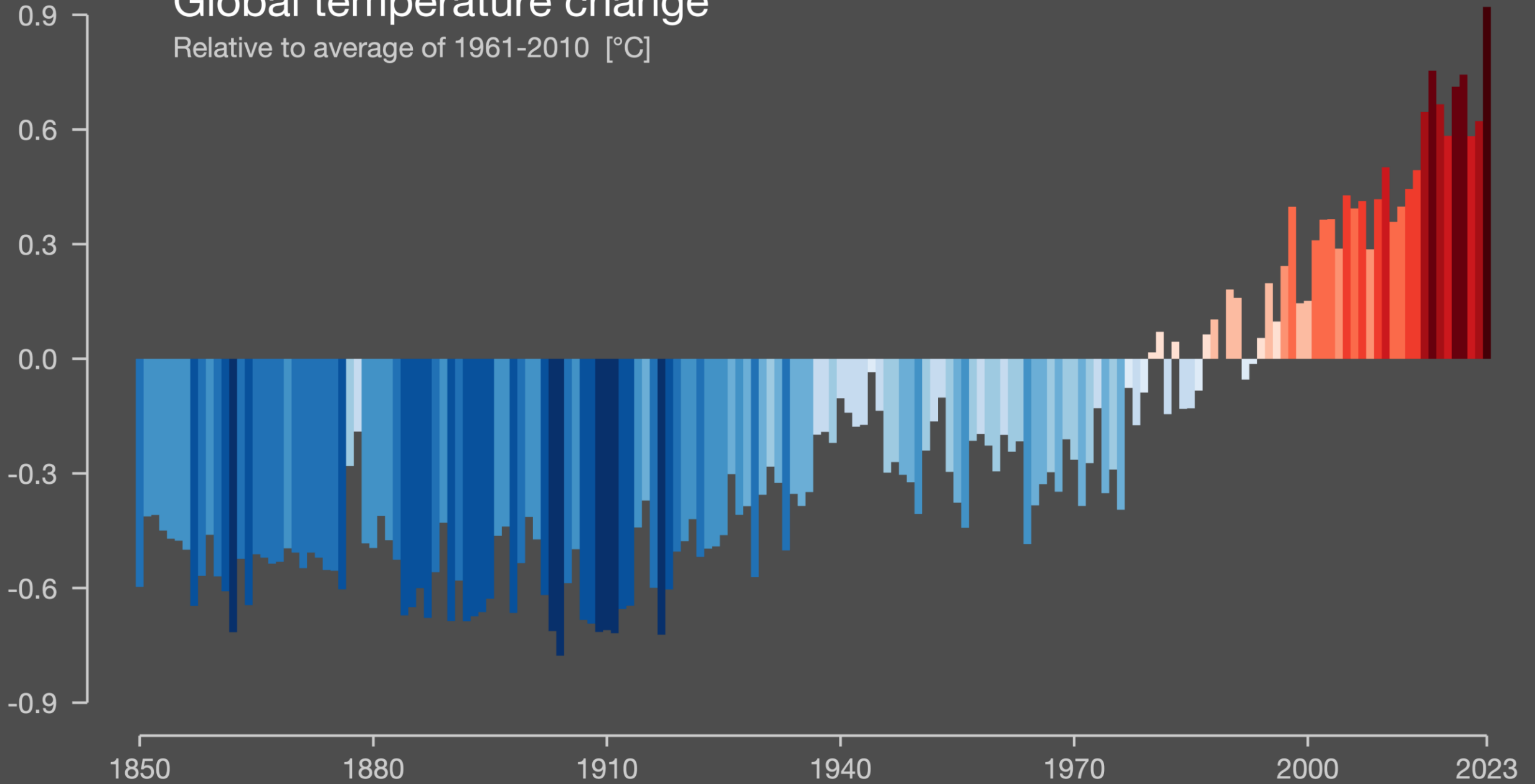


GLOBAL SURFACE TEMPERATURE

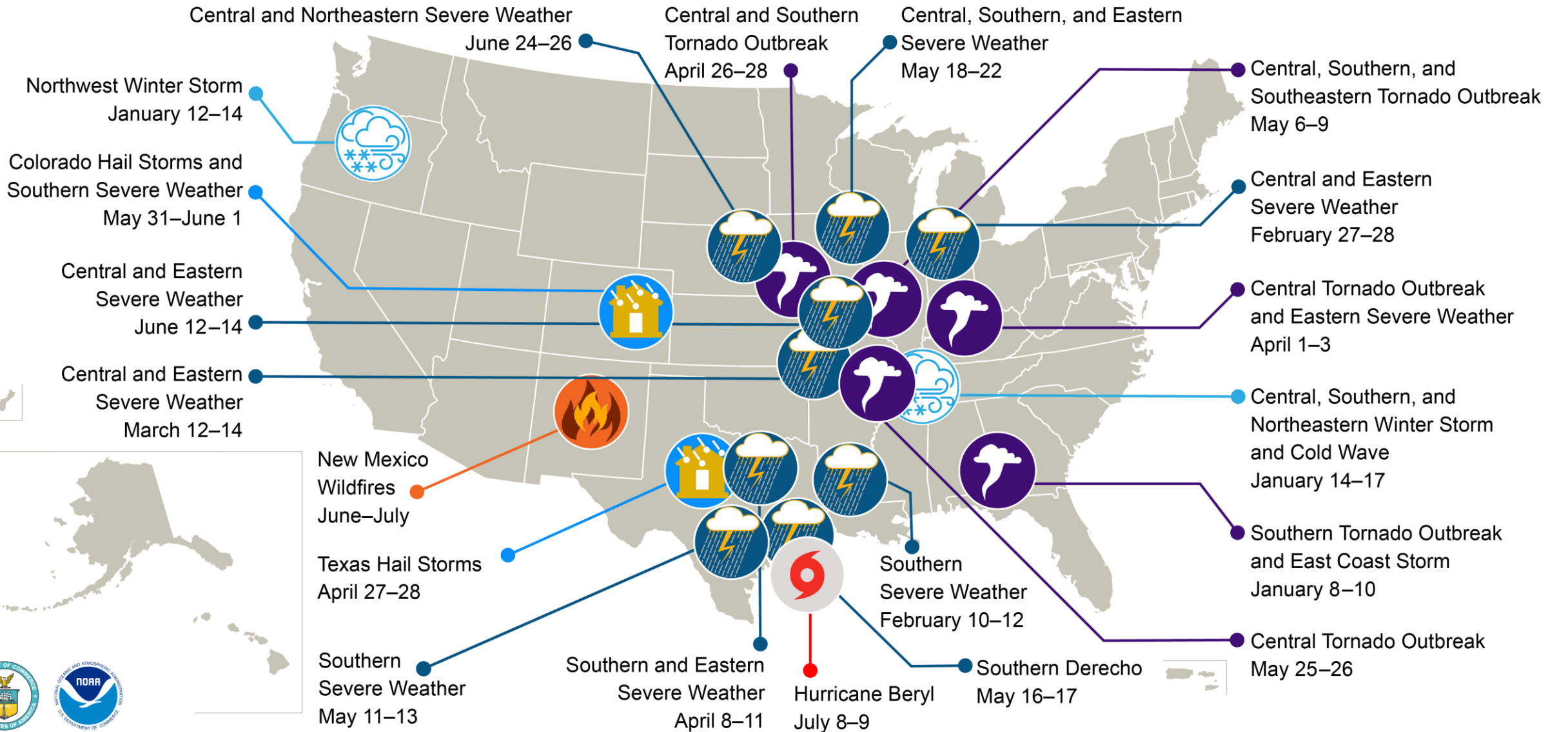
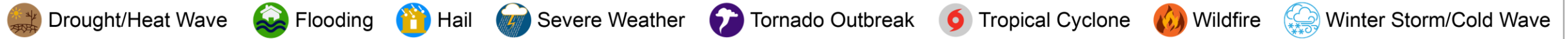


Global temperature change

Relative to average of 1961-2010 [°C]



U.S. 2024 Billion-Dollar Weather and Climate Disasters



This map denotes the approximate location for each of the 20 separate billion-dollar weather and climate disasters that impacted the United States through August 2024.

Climate change impacts on health

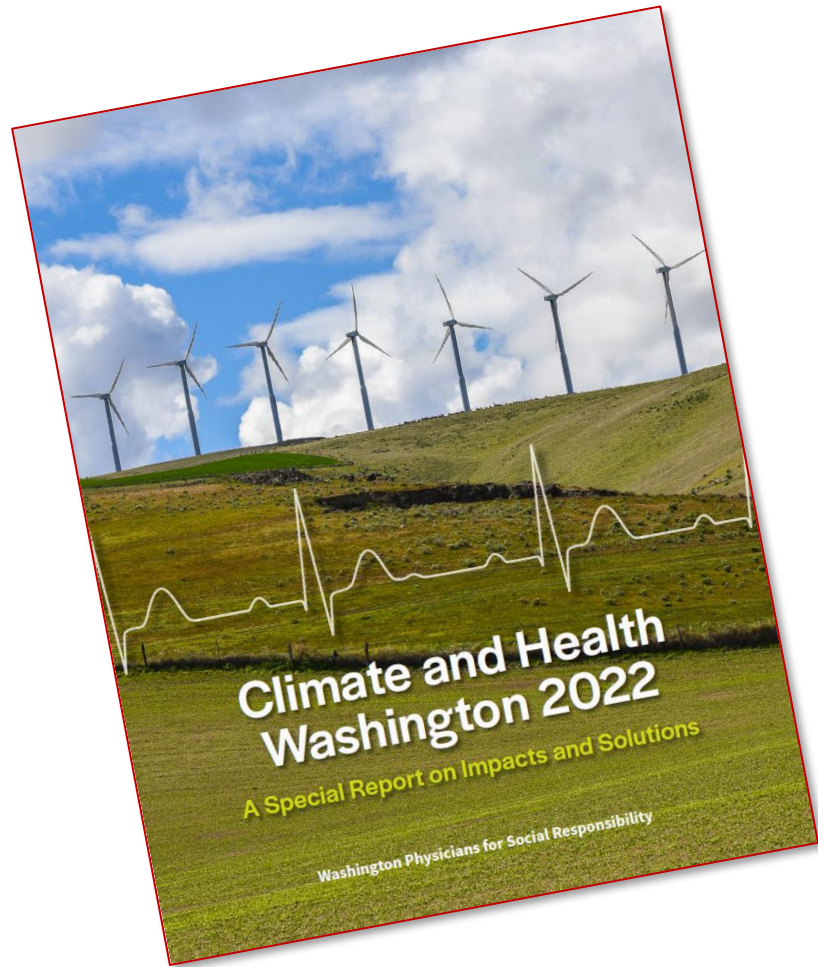
Climate change:

- Temperature rise
- Sea level rise
- Extreme weather



- ➔ Heat stress, cardiovascular failure, ↓work capacity
- ➔ Injuries, fatalities
- ➔ Asthma, cardiovascular disease
- ➔ Respiratory allergies, poison ivy
- ➔ Toxicity
- ➔ Malaria, dengue, hantavirus, encephalitis, Rift Valley fever
- ➔ Cholera, cryptosporidiosis, campylobacter, leptospirosis
- ➔ Malnutrition, diarrhea, harmful algal blooms
- ➔ Post-traumatic stress, depression, anxiety, despair
- ➔ Forced migration, civil conflict

Climate change impacts on health in Washington state



HEAT



FLOODS, STORMS



AIR POLLUTION



ALLERGIES



CHEMICAL EXPOSURES

VECTOR-BORNE DISEASES



WATER-BORNE DISEASES



WATER AND FOOD SUPPLY

MENTAL HEALTH



**RESOURCE SCARCITY,
UNINHABITABLE PLACES**



Three features of the climate-health connection



COMPLEXITY



INEQUITY



URGENCY



COMPLEXITY



INEQUITY



URGENCY

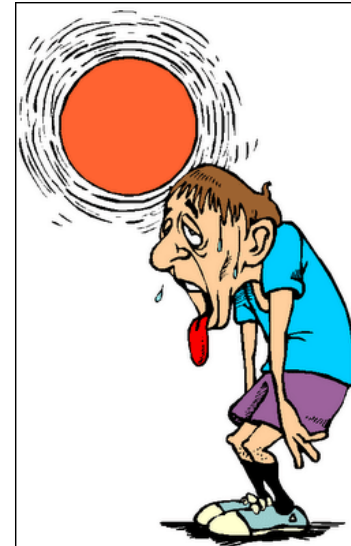
The direct health effects of heat



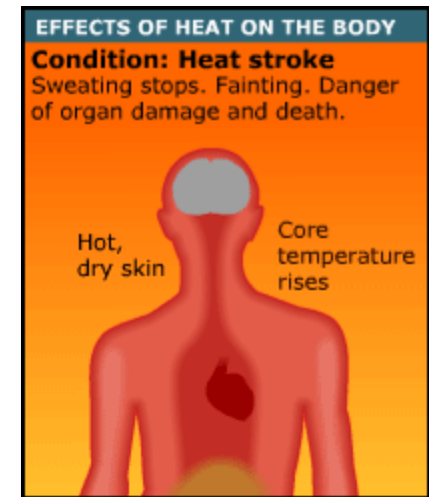
HEAT RASH



HEAT CRAMPS



HEAT EXHAUSTION

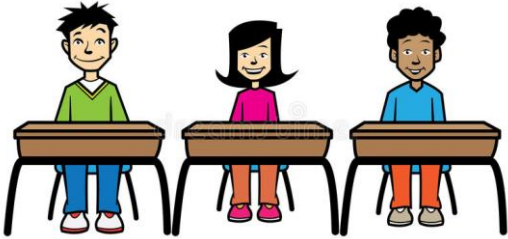
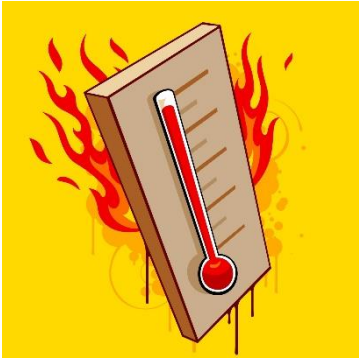


HEAT STROKE



Morgue in Karachi, Pakistan
2015 heat wave

The many faces of heat



Three features of the climate-health connection



COMPLEXITY

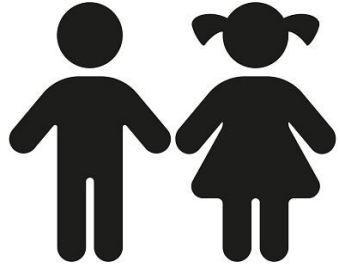


INEQUITY



URGENCY

Inequity: Differing patterns of risk



CHILDREN

Examples:

- Wildfires
- Diarrheal disease
- Anxiety



THE ELDERLY

Examples:

- Extreme heat
- Weather disasters



THE UNWELL

Examples:

- Air pollution
- Allergies
- Anxiety



**THE POOR, MEMBERS
OF MINORITY GROUPS**

Examples:

- Every adverse health outcome

Inequity: Heat vulnerability across the U.S.

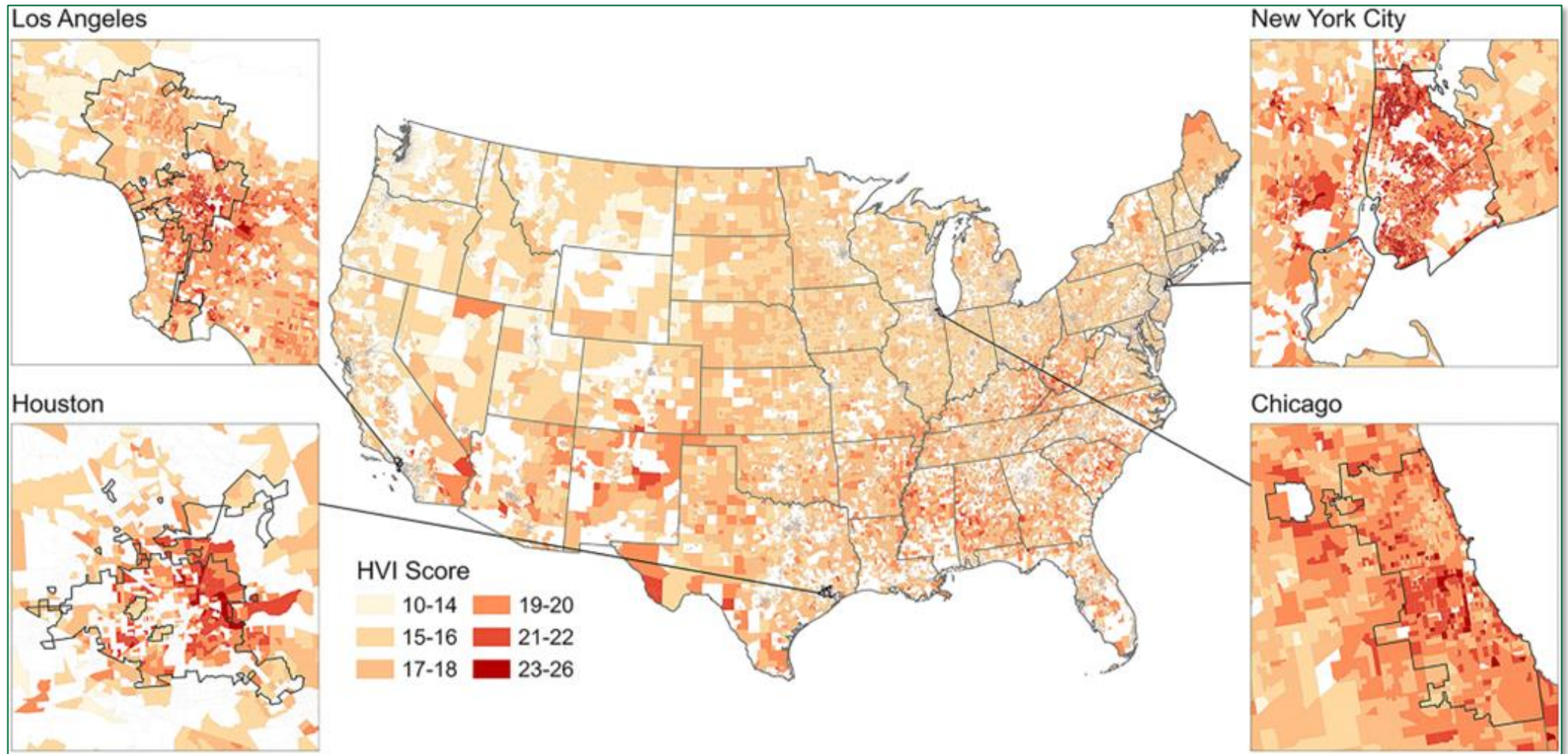


Created a **Heat Vulnerability Index:**

- Demographic
- Economic (unemployment; poverty)
- Social (living alone; educational level; foreign-born, ESL)
- Housing (age of housing)
- Health (diabetes prevalence)
- Land cover (high density development; impervious surface; green space)

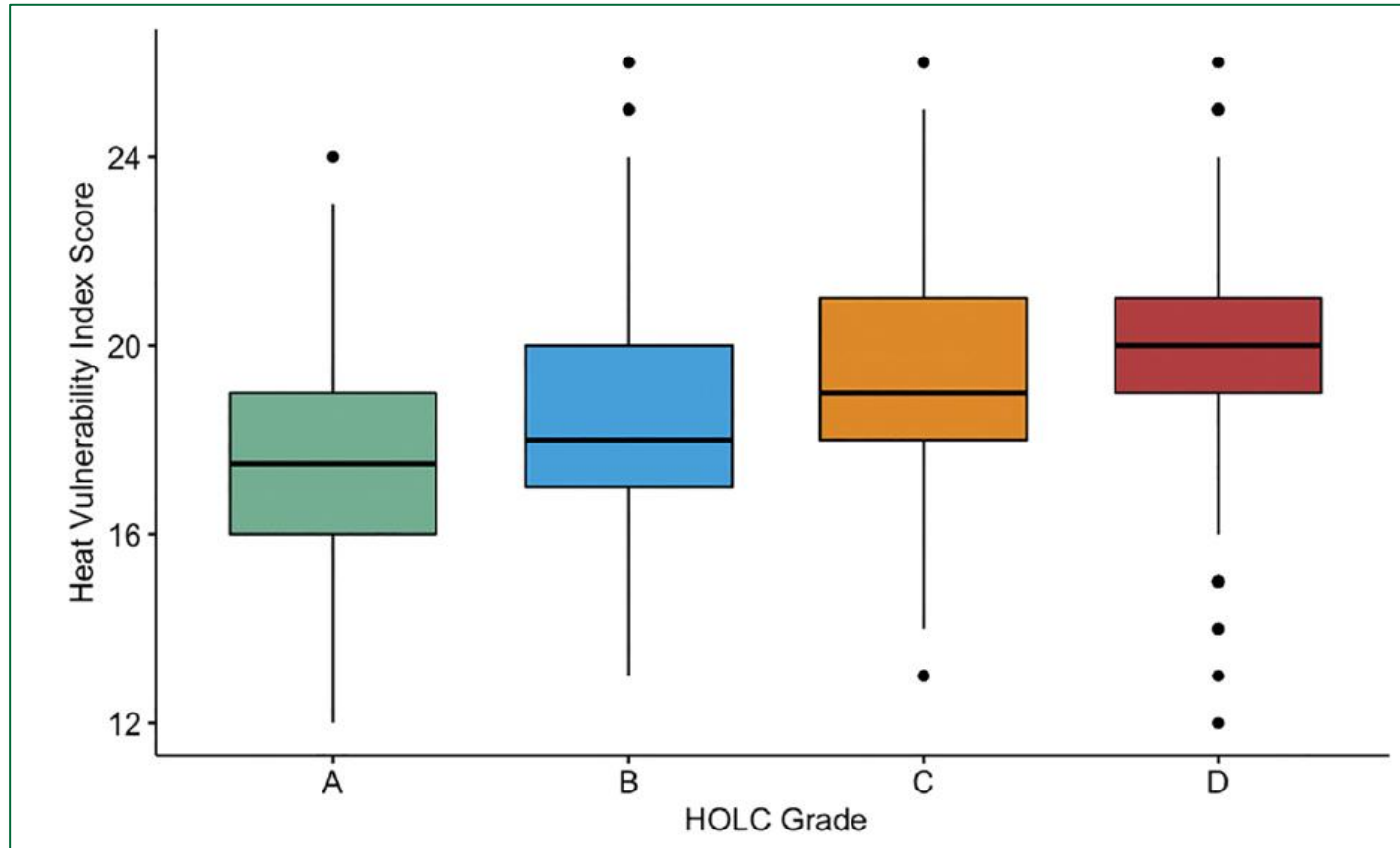
...and **assessed 55,267 US census tracts**

Inequity: Heat vulnerability across the U.S.



Major neighborhood disparities in Heat Vulnerability

Inequity: Heat vulnerability across the U.S.



Major neighborhood disparities in Heat Vulnerability:
associated with former redlining

Climate justice principles

- Climate change hits the poor and vulnerable hardest.
- Those hardest hit are least responsible for climate change.
- Climate change exacerbates underlying inequities.
- Equity must be inherent in climate solutions.



Three features of the climate-health connection



COMPLEXITY



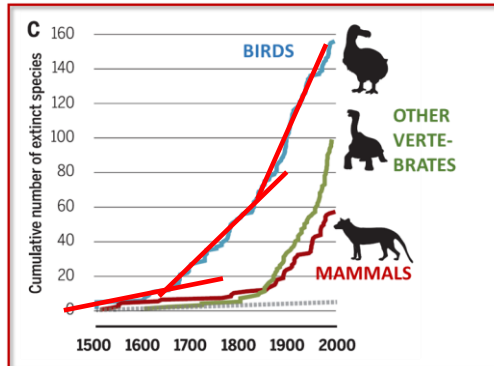
INEQUITY



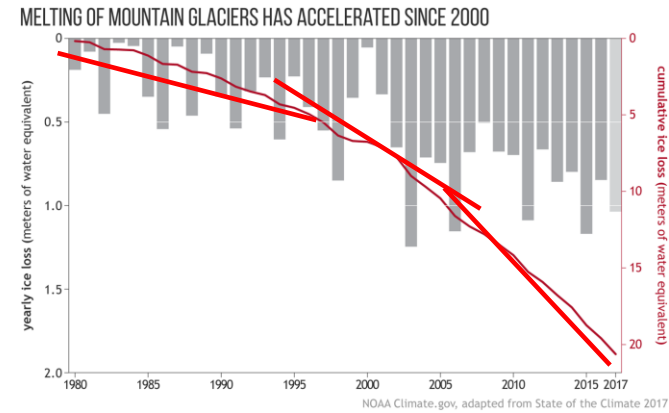
URGENCY

Urgency: Rapidly accelerating changes

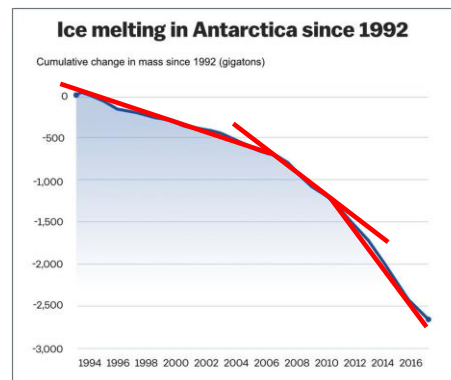
BIODIVERSITY LOSS¹



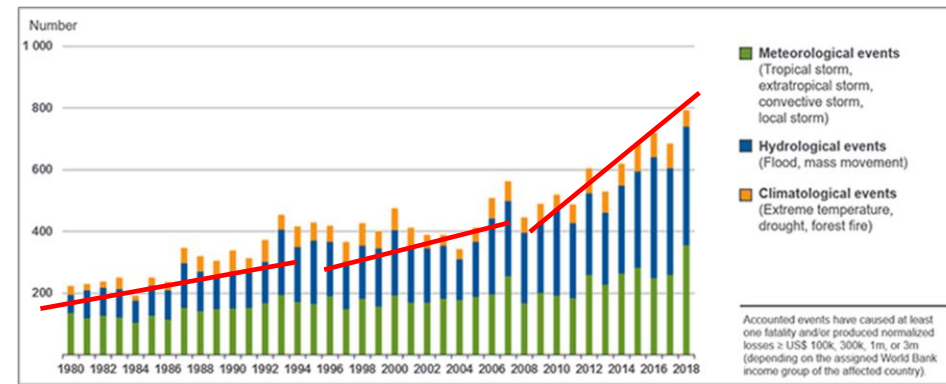
GLACIER LOSS³



ANTARCTIC SEA ICE LOSS²

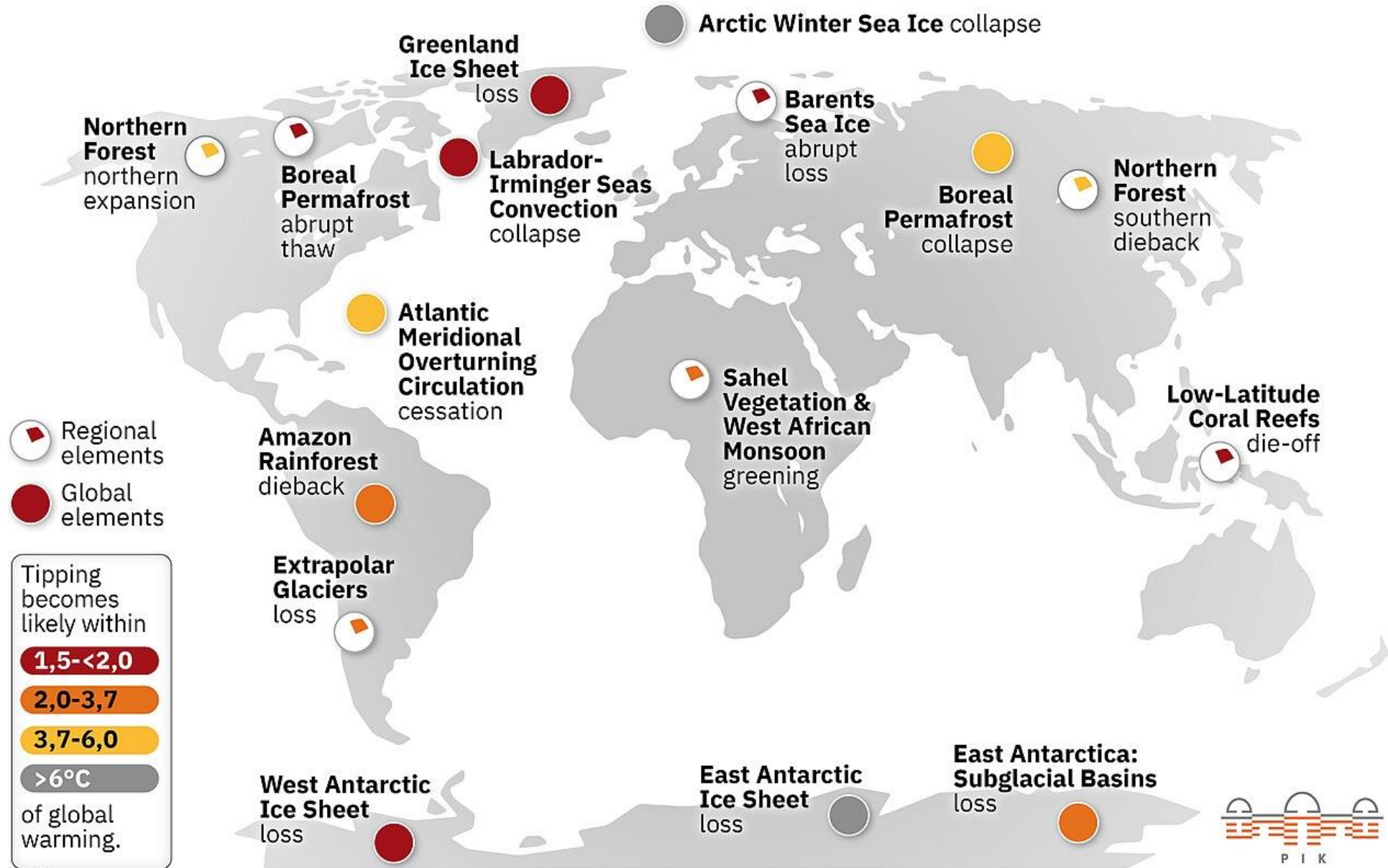


WEATHER-RELATED CATASTROPHES⁴

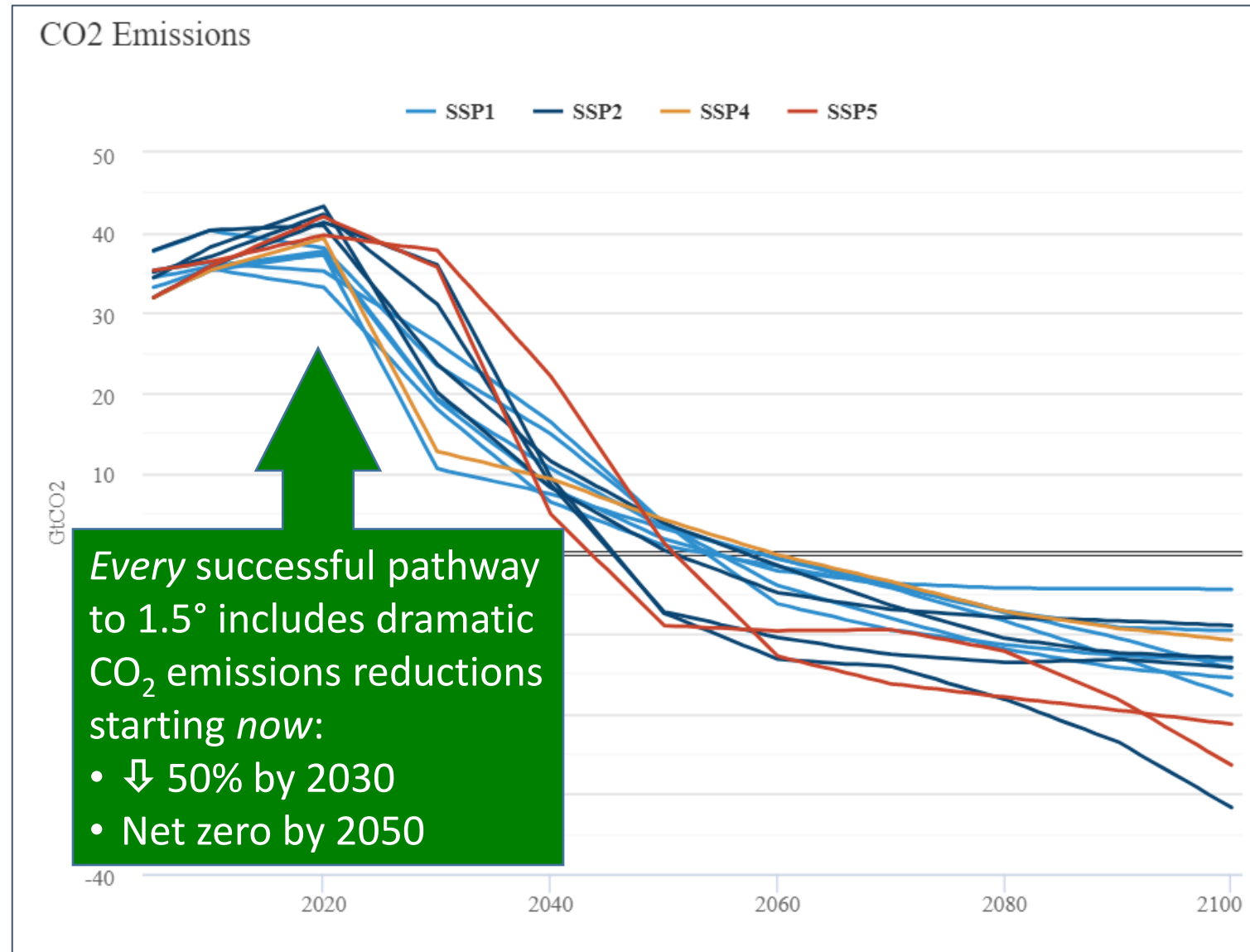


1. Johnson CN et al. Biodiversity losses and conservation responses in the Anthropocene. *Science*. 2017;356(6335):270-75.
2. Image from <https://www.vox.com/energy-and-environment/2019/9/25/20881595/ipcc-report-ocean-cryosphere-2019>, based on Shepherd A et al. Mass balance of the Antarctic Ice Sheet from 1992 to 2017. *Nature*. 2018;558(7709):219-22.
3. Scott M, Lindsey R. 2017 State of the climate: Mountain glaciers NOAA: 2018. <https://www.climate.gov/news-features/featured-images/2017-state-climate-mountain-glaciers>
4. Image from <https://www.iii.org/graph-archive/218092> based on data from Munich Re, Geo Risks Research, NatCatSERVICE

Urgency: Tipping points increasingly likely

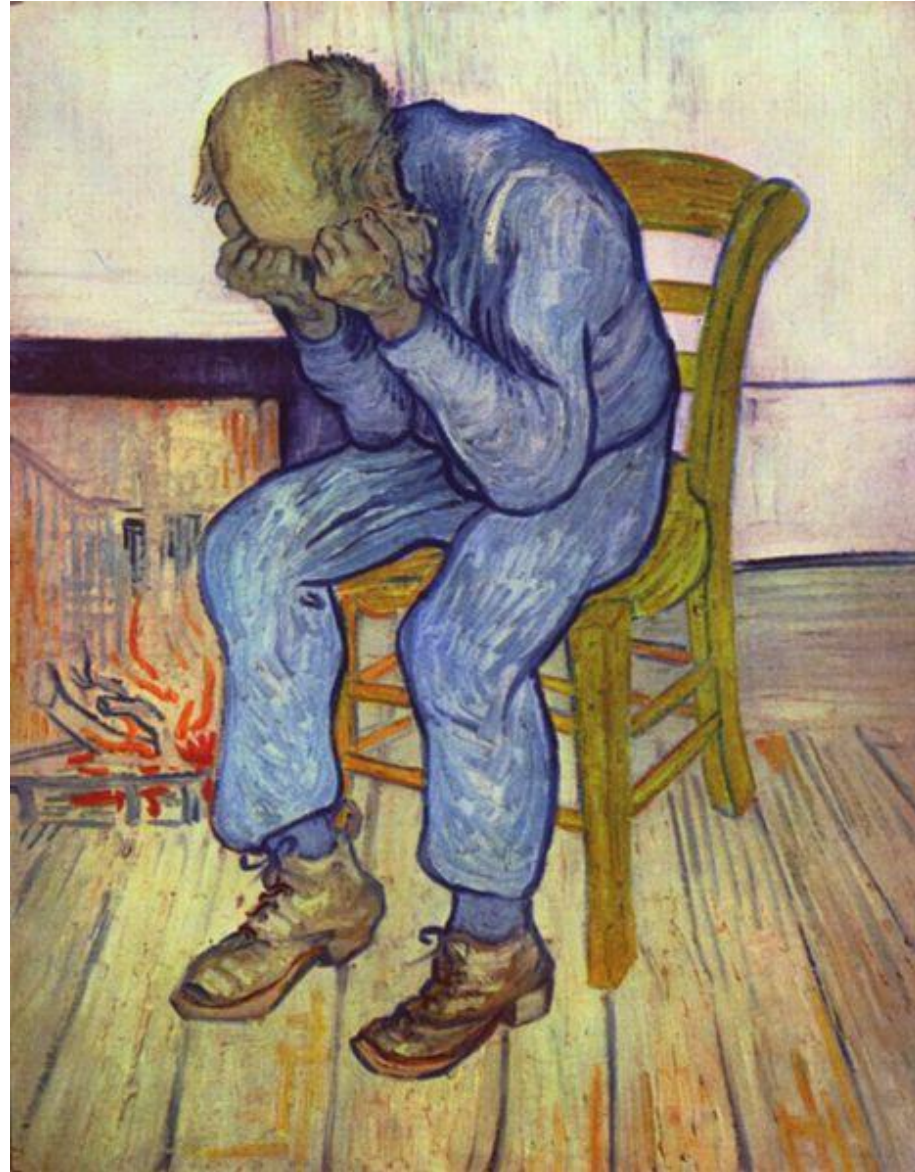


Urgency: Pathways to limit warming to 1.5°



EMERGENCY

I know how you must feel now.



Deep Adaptation: A Map for Navigating Climate Tragedy

IFLAS Occasional Paper 2

www.iflas.info

July 27th 2018¹

Professor Jem Bendell BA (Hons) PhD



Becoming hope-free: Parallels between
death of individuals and extinction
of homo sapiens

Guy R. McPherson

It is worse,
much worse,
than you think.



The Uninhabitable Earth | David Wallace-Wells



Mental health impacts



ILLUSTRATION BY ANNIE ZHAO

[Environment](#)

'Climate Despair' Is Making People Give Up on Life

"It's super painful to be a human being right now at this point in history."

By [Mike Peard](#)

[AZ](#) Illustrated By [Annie Zhao](#)

July 11, 2019, 4:00am [Share](#) [Tweet](#) [Snap](#)

MENTAL HEALTH

Is 'climate despair' making people depressed?

[Elizabeth Su](#) December 15, 2019

Climate Change Is Giving Us 'Pre-Traumatic Stress'

Betrayal and grief: Young people suffering from climate anxiety demand action

Climate change anxiety: Young people 'feel hopeless'

By [Steffan Messenger](#)
BBC Wales Environment Correspondent

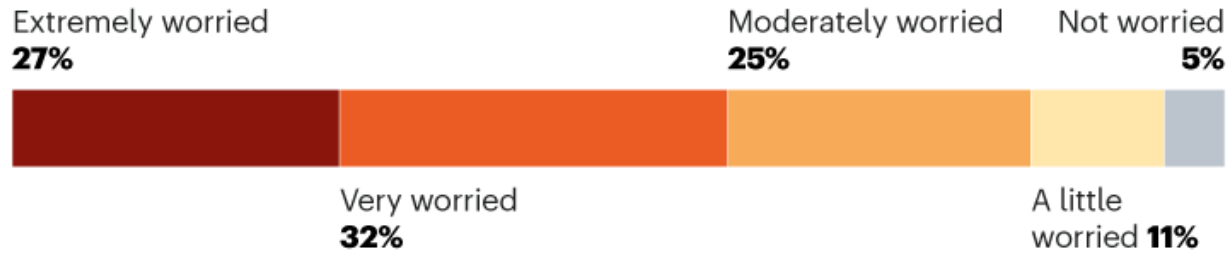
Earth Day Angst: Young People Cope with Sense of Urgency, Hopelessness about Climate Change

'Why Study for a Future We Don't Have?' Ask Student Climate Protesters

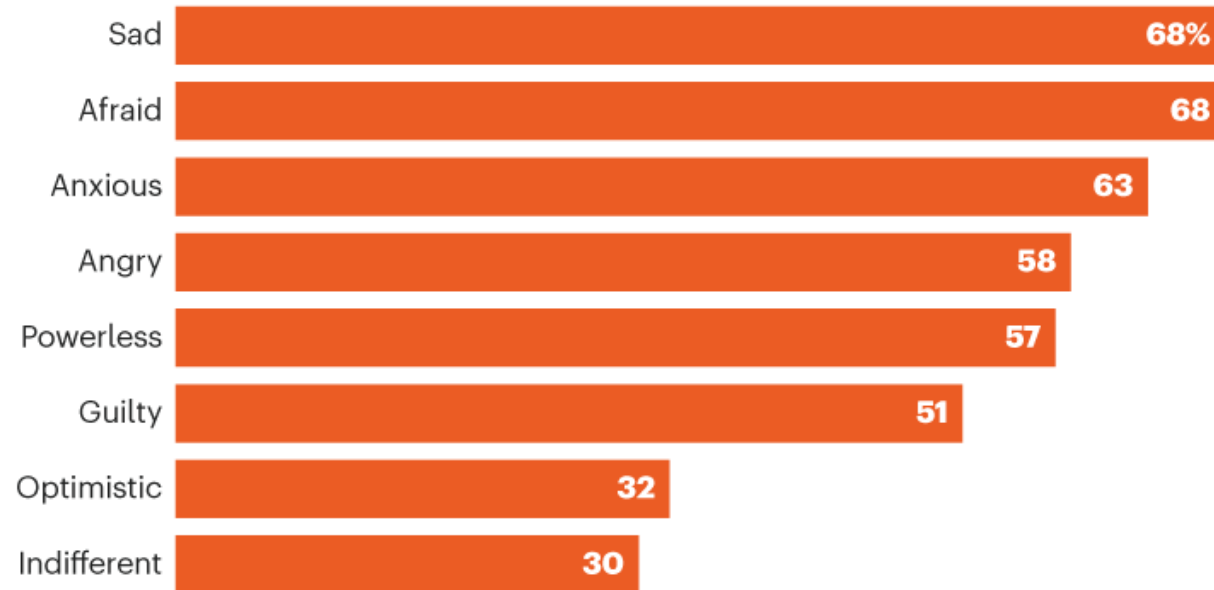
CLIMATE ANXIETY

A survey of 10,000 young people shows that negative feelings about climate change can cause psychological distress.

How worried are you about climate change?



Climate change makes me feel...



Countries surveyed:

- UK
- Finland
- France
- USA
- Australia
- Portugal
- Brazil
- India
- Philippines
- Nigeria

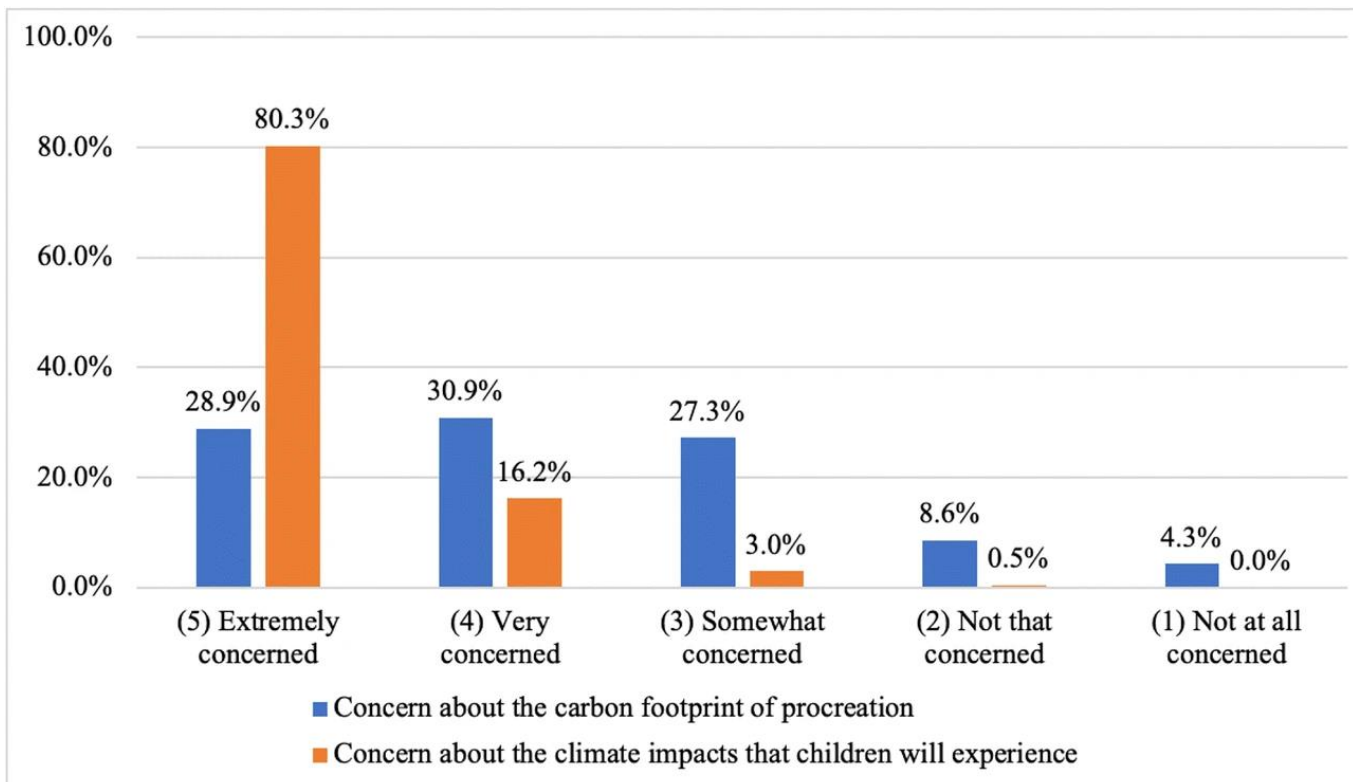
Graphic from Thompson T. Young people's climate anxiety revealed in landmark survey. *Nature news*, 22 September 2021. <https://doi.org/10.1038/d41586-021-02582-8>.
Based on data from: Hickman C, Marks E, Pihkala P, Clayton S, Lewandowski RE, Mayall EE, et al. 2021. Young people's voices on climate anxiety, government betrayal and moral injury: A global phenomenon. <https://dx.doi.org/10.2139/ssrn.3918955>.



Eco-reproductive concerns in the age of climate change

Matthew Schneider-Mayerson¹  • Kit Ling Leong¹

Survey: 607 Americans aged 27-45



“I feel like I can’t in good conscience bring a child into this world and force them to try and survive what may be apocalyptic conditions.”

27-year-old woman

“I regret having my kids because I am terrified that they will be facing the end of the world due to climate change.”

40-year-old mother



Hope: A definition

“the perceived capability to derive pathways to desired goals, and motivate oneself via agency thinking to use those pathways”

Snyder CR. Hope Theory: Rainbows in the mind.
Psychological Inquiry 2002;13(4):249-75.

Three components:

- A goal
- A plan (“pathway”)
- Ability to act (“agency”)

Hope is different than optimism

“Hope is a verb with its sleeves rolled up. Hopeful people are actively engaged in defying the odds or changing the odds. Optimism leans back, puts its feet up, and wears a confident look.”

Orr DW. Optimism and hope in a hotter time.
Conservation Biology 2007;21(6):1392-95.



VS.



Three arguments for hope

Hopeful
people feel
better.



Clinical evidence on the benefits of hope

Hopeful people...

Feel better

- Scheier MF, Carver CS. Optimism, coping, and health: assessment and implications of generalized outcome expectancies. *Health Psychol* 1985; **4**(3): 219-47.
- Scheier MF, Carver CS. Effects of optimism on psychological and physical well-being: Theoretical overview and empirical update. *Cog Therap Res* 1992; **16**(2): 201-28.
- Kwon P. Hope and dysphoria: The moderating role of defense mechanisms. *J Personality* 2000; **68**(2): 199-223. doi: <https://doi.org/10.1111/1467-6494.00095>.

Handle stress better

- Mitchell UA, Dellor ED, Sharif MZ, et al. When is hope enough? Hopefulness, discrimination and racial/ethnic disparities in allostatic load. *Behav Med* 2020; **46**(3-4): 189-201.
- Breznitz S. The effect of hope on coping with stress. In: Appley MH, Trumbull R, eds. *Dynamics of Stress: Physiological, Psychological and Social Perspectives*. New York: Plenum; 1986: 295-306.

Live longer

- Everson SA, Goldberg DE, Kaplan GA, et al. Hopelessness and risk of mortality and incidence of myocardial infarction and cancer. *Psychosom Med* 1996; **58**(2): 113-21.
- Zhu AQ, Kivork C, Vu L, et al. The association between hope and mortality in homebound elders. *Int J Geriatr Psychiatr* 2017; **32**(12): e150-e6.

Have greater cognitive flexibility and creativity

- Clore GL, Schwarz N, Conway M. Affective causes and consequences of social information processing. In: R.S. Wyer Jr. TKS, ed. *Handbook of Social Cognition* (2nd ed), Hillsdale, NJ Erlbaum; 1994: 323-417.

Have higher academic achievement

- Marques SC, Gallagher MW, Lopez SJ. Hope- and Academic-Related Outcomes: A Meta-Analysis. *School Mental Health* 2017; **9**(3): 250-62

Clinical evidence on the risks of hopelessness

Hopeless people have increased risk of...

Hypertension	<ul style="list-style-type: none"> • Everson SA, Kaplan GA, Goldberg DE, Salonen JT. Hypertension incidence is predicted by high levels of hopelessness in Finnish men. <i>Hypertension</i> 2000; 35(2): 561-7.
Atherosclerosis	<ul style="list-style-type: none"> • Everson SA, Kaplan GA, Goldberg DE, Salonen R, Salonen JT. Hopelessness and 4-year progression of carotid atherosclerosis. The Kuopio Ischemic Heart Disease Risk Factor Study. <i>Arterioscler Thromb Vasc Biol</i> 1997; 17(8): 1490-5. • Anda R, Williamson D, Jones D, et al. Depressed affect, hopelessness, and the risk of ischemic heart disease in a cohort of U.S. adults. <i>Epidemiology</i> 1993; 4(4): 285-94.
Myocardial infarction	<ul style="list-style-type: none"> • Everson SA, Goldberg DE, Kaplan GA, et al. Hopelessness and risk of mortality and incidence of myocardial infarction and cancer. <i>Psychosom Med</i> 1996; 58(2): 113-21.
Cancer	<ul style="list-style-type: none"> • Everson SA, Goldberg DE, Kaplan GA, et al. Hopelessness and risk of mortality and incidence of myocardial infarction and cancer. <i>Psychosom Med</i> 1996; 58(2): 113-21.
Anxiety	<ul style="list-style-type: none"> • Gallagher MW, Long LJ, Richardson A, et al. Examining Hope as a Transdiagnostic Mechanism of Change Across Anxiety Disorders and CBT Treatment Protocols. <i>Behav Therap</i> 2020; 51(1): 190-202.
Depression	<ul style="list-style-type: none"> • Alford BA, Lester JM, Patel RJ, Buchanan JP, Giunta LC. Hopelessness predicts future depressive symptoms: A prospective analysis of cognitive vulnerability and cognitive content specificity. <i>J Clin Psychol</i> 1995; 51(3): 331-9.
Cognitive decline	<ul style="list-style-type: none"> • Håkansson K, Soininen H, Winblad B, Kivipelto M. Feelings of hopelessness in midlife and cognitive health in later life: A prospective population-based cohort study. <i>PLoS One</i> 2015; 10(10): e0140261
Worse PTSD symptoms	<ul style="list-style-type: none"> • Raman U, Bonanno PA, Sachdev D, et al. Community violence, PTSD, hopelessness, substance use, and perpetuation of violence in an urban environment. <i>Community Mental Health J</i> 2021; 57(4): 622-30.
Risky behavior (youth)	<ul style="list-style-type: none"> • Bolland JM. Hopelessness and risk behaviour among adolescents living in high-poverty inner-city neighbourhoods. <i>J Adolesc</i> 2003; 26(2): 145-58. • Fedorowicz AR, Hellerstedt WL, Schreiner PJ, Bolland JM. Associations of adolescent hopelessness and self-worth with pregnancy attempts and pregnancy desire. <i>Am J Public Health</i> 2014; 104(8): e133-40. • Burnside AN, Gaylord-Harden NK. Hopelessness and Delinquent Behavior as Predictors of Community Violence Exposure in Ethnic Minority Male Adolescent Offenders. <i>J Abnorm Child Psychol</i> 2019; 47(5): 801-10.

Three arguments for hope

Hopeful
people feel
better.

Hope leads
to action.



- Bloodhart B, Ballew MT, et al. How hope and doubt affect climate change mobilization. *Front Communic* 2019; 4(20).
- Ojala M. Hope and climate change: the importance of hope for environmental engagement among young people. *Environ Educ Res* 2012;18(5): 625-42

Three arguments for hope

Hopeful
people feel
better.

Hope leads
to action.

Hope is
empirically
justified.



Reasons for hope

1. Technology is advancing
2. Economics is improving
3. Activism is blossoming
4. Policy is maturing
5. Public opinion is shifting
6. Culture change is possible
7. Results are emerging
8. Extensive co-benefits



Health benefits of climate mitigation

**CLEAN
ENERGY**



LESS HEART DISEASE

LESS LUNG DISEASE

**WELL-
DESIGNED
CITIES**



LESS CANCER

BETTER MENTAL HEALTH

LESS INFECTIOUS DISEASE

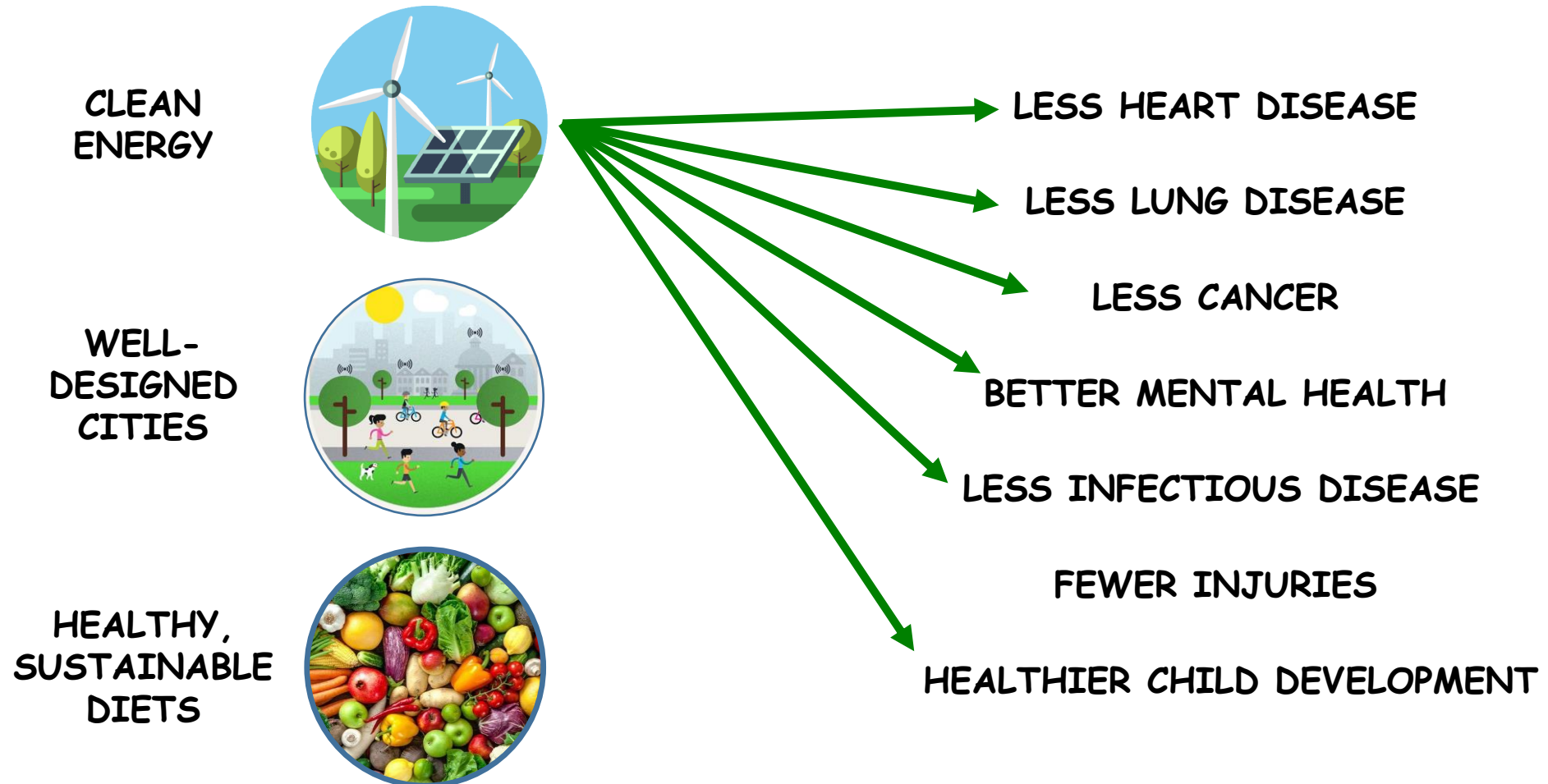
**HEALTHY,
SUSTAINABLE
DIETS**



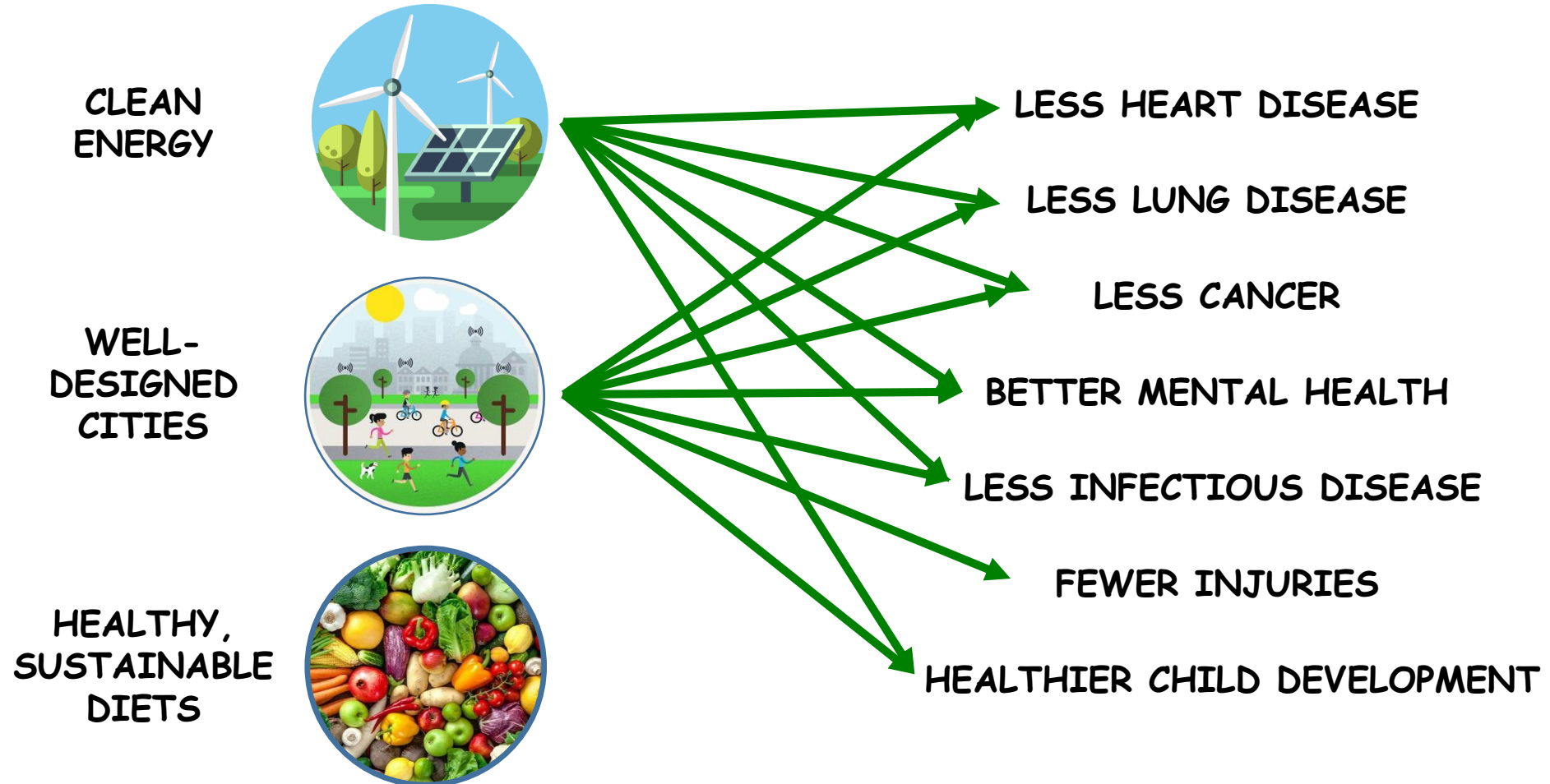
FEWER INJURIES

HEALTHIER CHILD DEVELOPMENT

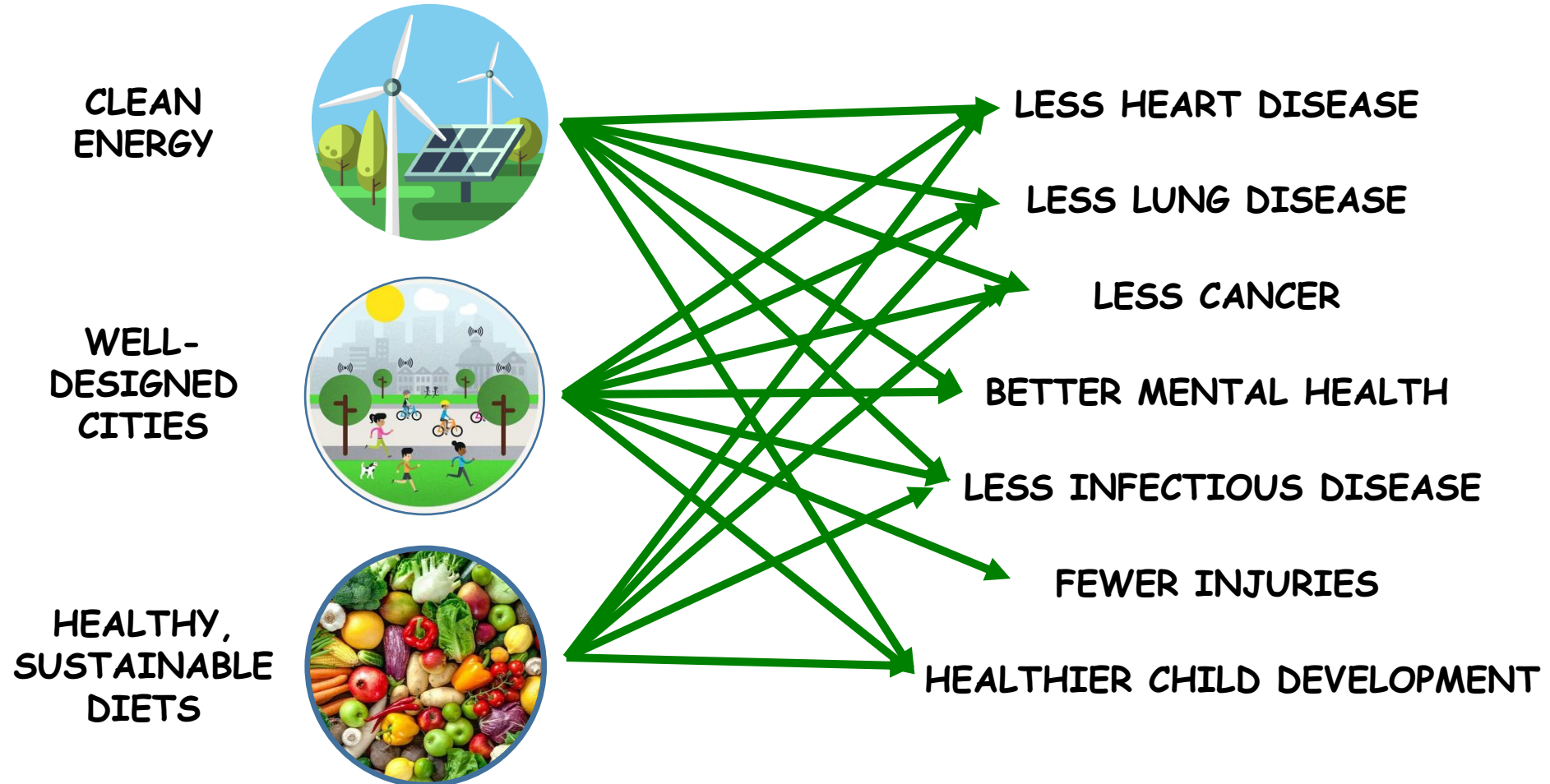
Health benefits of climate mitigation



Health benefits of climate mitigation



Health benefits of climate mitigation



Propelling hope: A user's guide



Tell the truth.



Acknowledge grief.



Articulate a vision of success.



Identify pathways toward that vision.



Empower people to take action.



Cultivate solidarity.



Make room for joy.

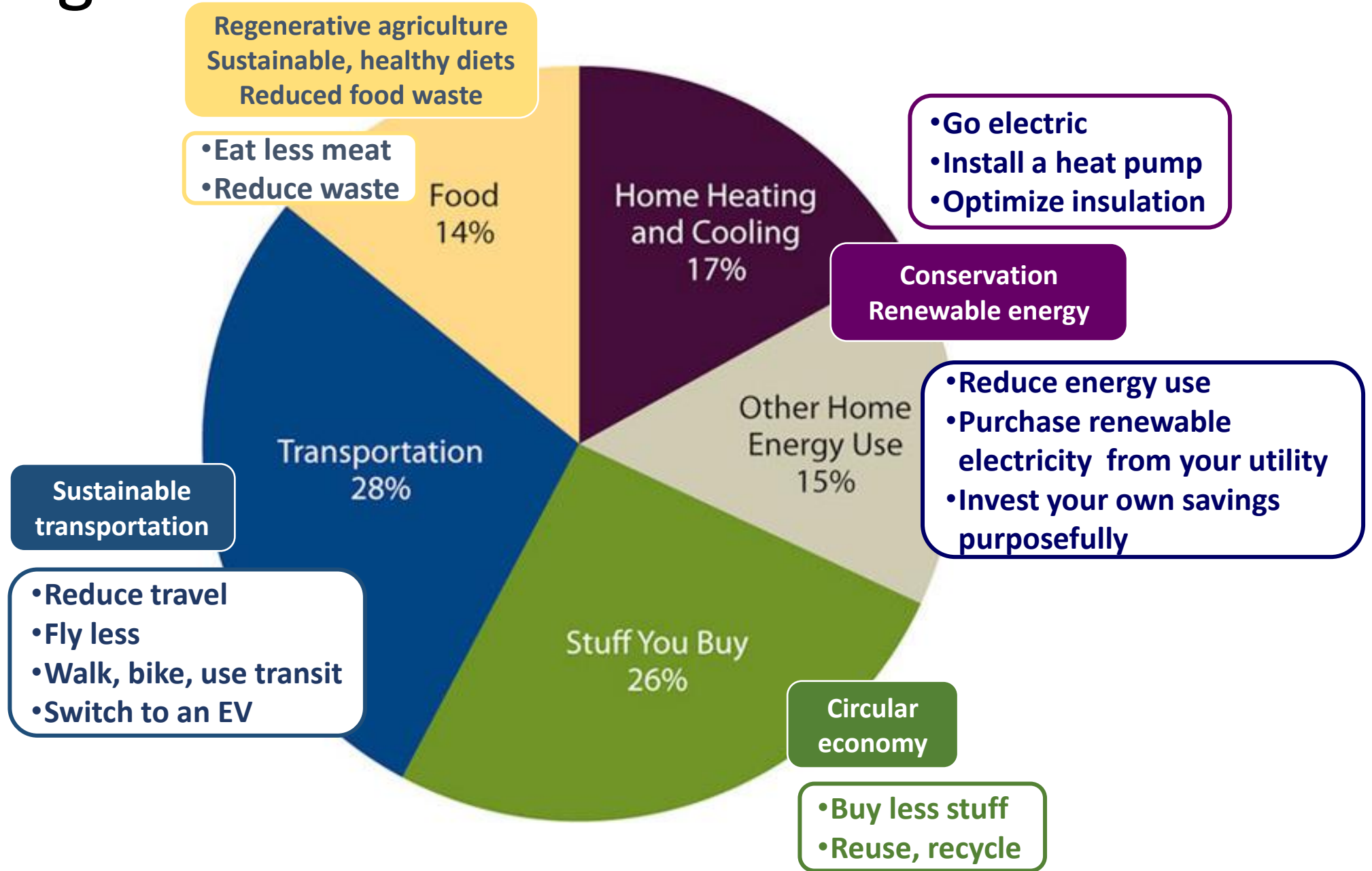
The many roles of the health professional





As a private citizen...	What do you eat, how do you travel, how do you consume goods and energy?
As a clinician...	How you care for and counsel your patients?
As an institutional leader...	Is your practice or hospital “green”? Does your curriculum teach about climate change?
As a researcher...	Do you incorporate climate into your research agenda? Your research procedures?
As a trusted community voice...	Do you speak out publicly on climate change?

The average American's carbon emissions



Your personal decisions



<https://www3.epa.gov/carbon-footprint-calculator/>

<https://www.carbonfootprint.com/calculator.aspx>

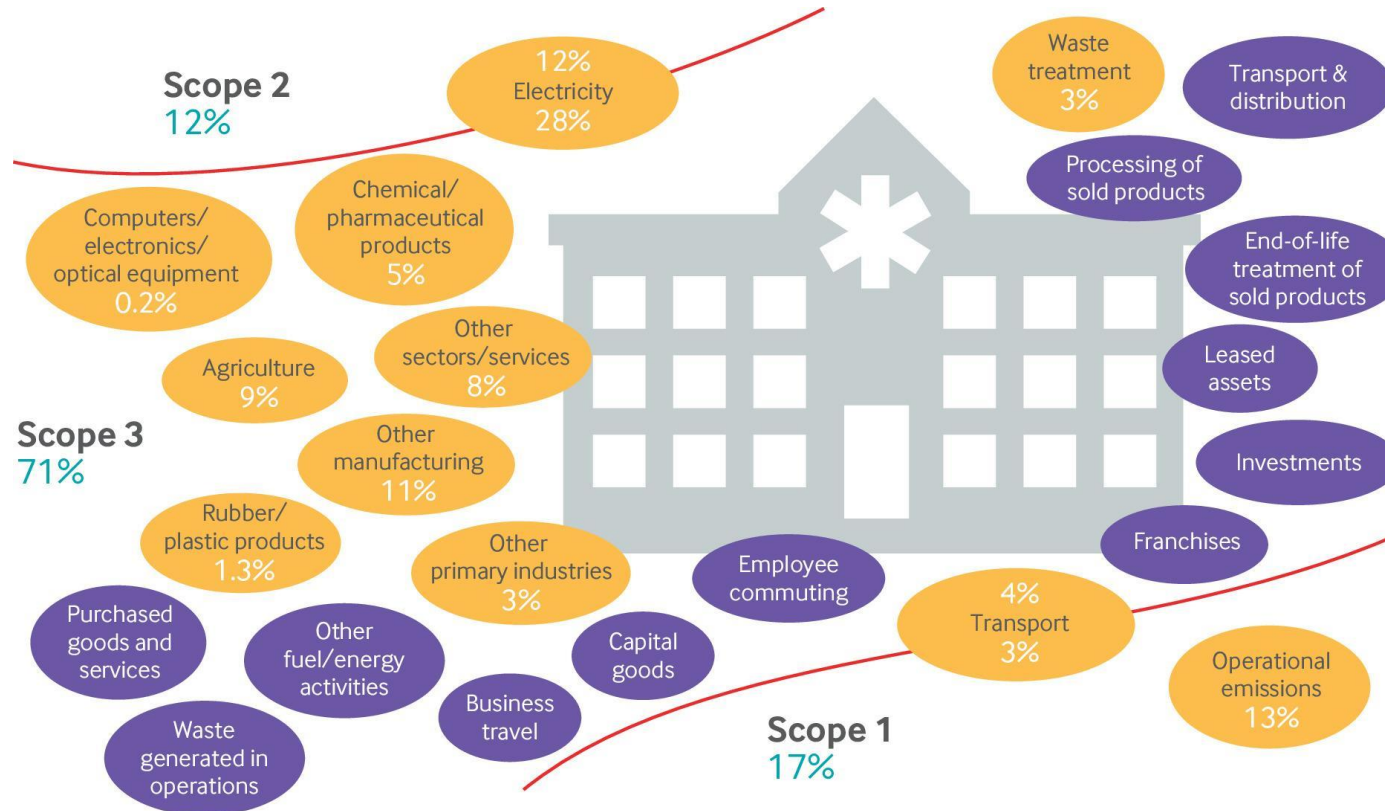
<https://www.nature.org/en-us/get-involved/how-to-help/carbon-footprint-calculator/>



As a private citizen...	What do you eat, how do you travel, how do you consume goods and energy?
As a clinician...	How do you care for and counsel your patients?
As an institutional leader...	Is your practice or hospital “green”? Does your curriculum teach about climate change?
As a researcher...	Do you incorporate climate into your research agenda? Your research procedures?
As a trusted community voice...	Do you speak out publicly on climate change?

Green health care

The health sector accounts for **8.5%** of U.S. GHG emissions



Many components of scope 3 are "unmeasured" and are not fully captured in the 71% of total emissions. These are depicted in purple.

Green health care



U.S. Department of Health and Human Services
Enhancing the health and well-being of all Americans

About HHS | Programs & Services | Grants & Contracts | Laws & Regulations

Home > Climate Change & Health Equity, and Environmental Justice at HHS > Climate Change and Health Equity > Actions > Health Sector Pledge

About the Office of Climate Change and Health Equity (OCCHE) | Climate Change & Health Equity, and Environmental Justice at HHS | About the Office of Environmental Justice (OEJ)


Health Sector Commitments to Emissions Reduction and Resilience



The Medical Society Consortium
ON CLIMATE & HEALTH



COLUMBIA | MAILMAN SCHOOL OF PUBLIC HEALTH
GLOBAL CONSORTIUM ON CLIMATE AND HEALTH EDUCATION



NATIONAL ACADEMY of MEDICINE
**ACTION COLLABORATIVE ON
DECARBONIZING THE
U.S. HEALTH SECTOR**



Health Care Without Harm

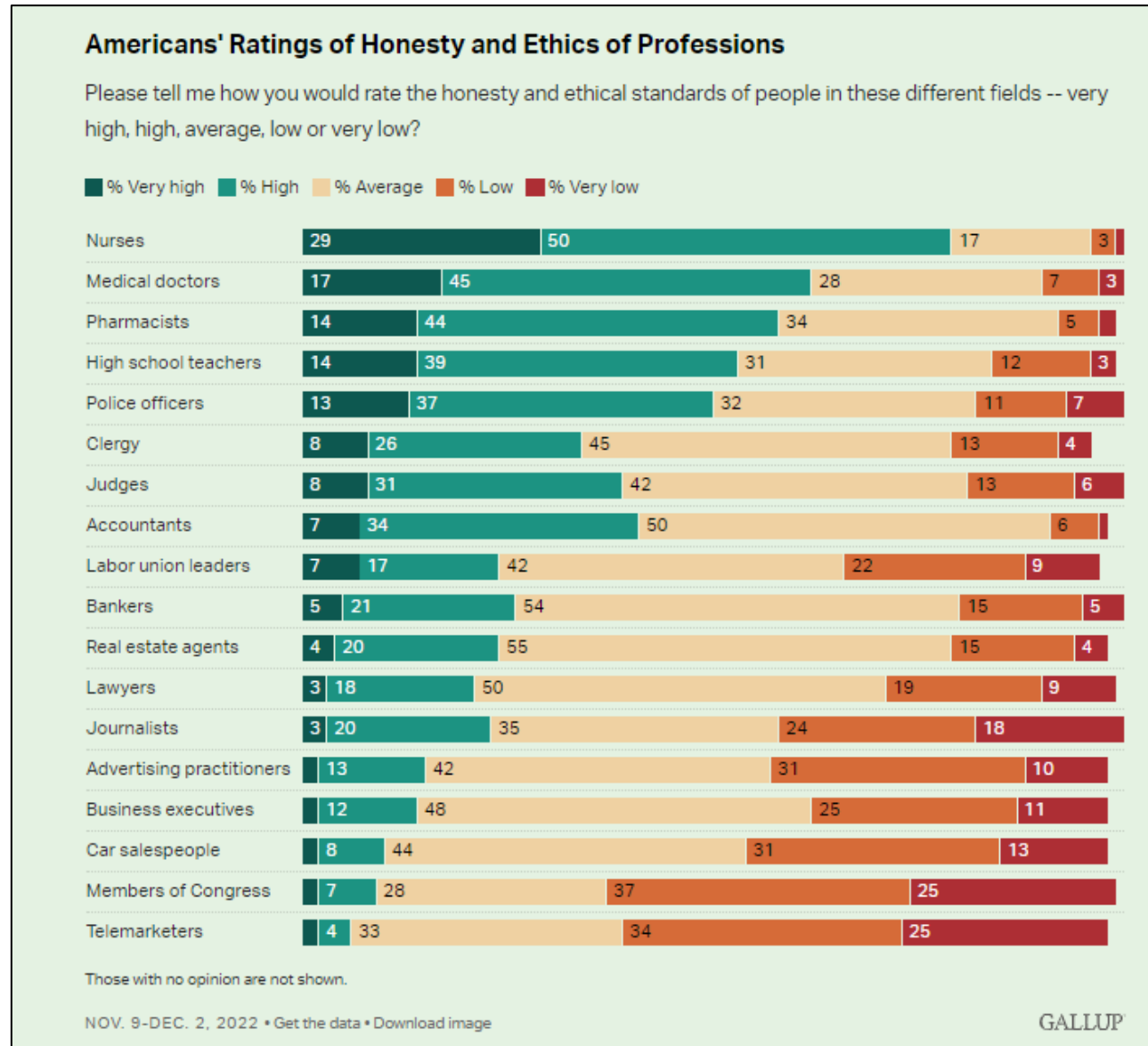
Leading the global movement for environmentally responsible health care

Welcome to Health Care Without Harm! Please join us as we work to transform the health sector worldwide, promoting environmental health and justice.



As a private citizen...	What do you eat, how do you travel, how do you consume goods and energy?
As a clinician...	How do you care for and counsel your patients?
As an institutional leader...	Is your practice or hospital “green”? Does your curriculum teach about climate change?
As a researcher...	Do you incorporate climate into your research agenda? Your research procedures?
As a trusted community voice...	Do you speak out publicly on climate change?

Nurses and doctors: the most trusted professions



Government's support of natural gas development fuels emissions

To the editor,
Re: Nanaimo isn't on track to meet emission targets, Nov. 18.
There are two principal reasons why Nanaimo's emissions continue to increase.

One is due to previous councils failing to prioritize and fund active transportation (walking, cycling, transit), and the current failure to prioritize safe walking and cycling during the pandemic by narrowing vehicle lanes in favour of pedestrians and cyclists. If we don't feel safe driving.

The other reason is wholly outside of the control of anyone in Nanaimo. It is the Liberal and now the NDP provincial governments subsidizing the production of natural gas. This has driven down the cost of this polluting product while electricity prices continue to rise, leading to homeowners switching from clean electricity to natural gas. Municipalities also receive income from Fortis Gas.

Not even our MLAs concerned about this.

This is tragic. Not only do buildings being supplied by natural gas risk burning down in the event of the expected earthquake, but when our provincial and federal governments finally divorce their fossil fuel mates then people heating with natural gas will get hit with huge carbon fees.

It is easy to utter the words, 'climate crisis.' It is a wholly different matter to act as though our lives are

Ian Gartshof
Nanaimo

LETTERS TO THE EDITOR

Wednesday



EXPERT TESTIMONY

C-SPAN
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What's soil got to do with climate change?

Photos: John A. Kehley



PUBLIC SPEAKING



PROTEST ACTION

Summing it all up...

- Climate change is disrupting many planetary systems...
- ...which threatens human health and well-being through multiple pathways.
- These health threats:
 - Are highly complex.
 - Affect different populations differently.
 - Must be urgently addressed.
- But within this grim narrative lies opportunity.
- It is essential to propel hope.
- And there is much that physicians can do.

I just need
the main ideas

