

The Health Emergency of our Changing Climate

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Responsibility Environmental Health Committee

April 28, 2020



Thanks to PSR and the Climate and Health
Literacy Consortium



Global warming made simple

- **It's real**
- We're causing it (unequally)
- It's bad for us (unequally)
- There are things we can do
- There are “co-benefits” to doing them
- Epilogue



“Climate change could be the biggest global health threat of the 21st century... The impacts will be felt all around the world – and not just in some distant future but in our lifetimes and those of our children.”

--The Lancet, 11/09

Source: <http://www.thelancet.com/climate-change>



USDA, Wikimedia Commons

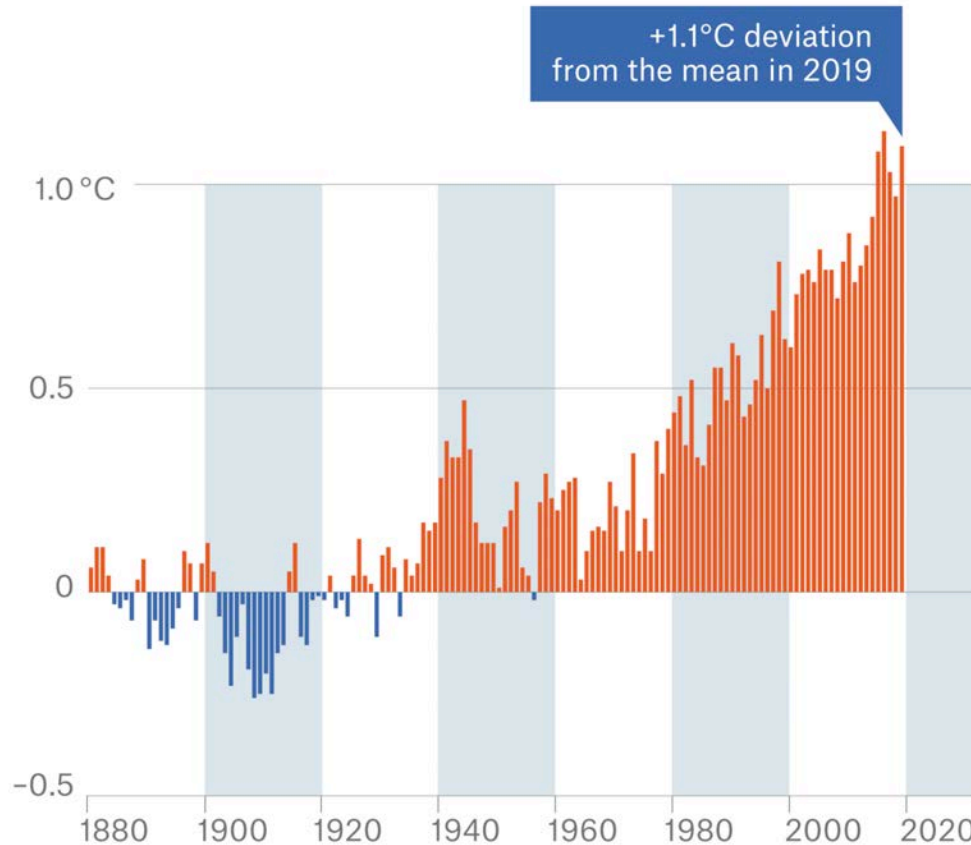


NOAA, Wikimedia Commons



Suat Eman, freedigitalphotos.net

19 of the 20 warmest years in the period 2001-2019
Deviation from the 1880-1900 average



Reinsurance
companies insure
insurance companies

Source: <https://www.munichre.com/en/risks/climate-change-a-challenge-for-humanity.html>



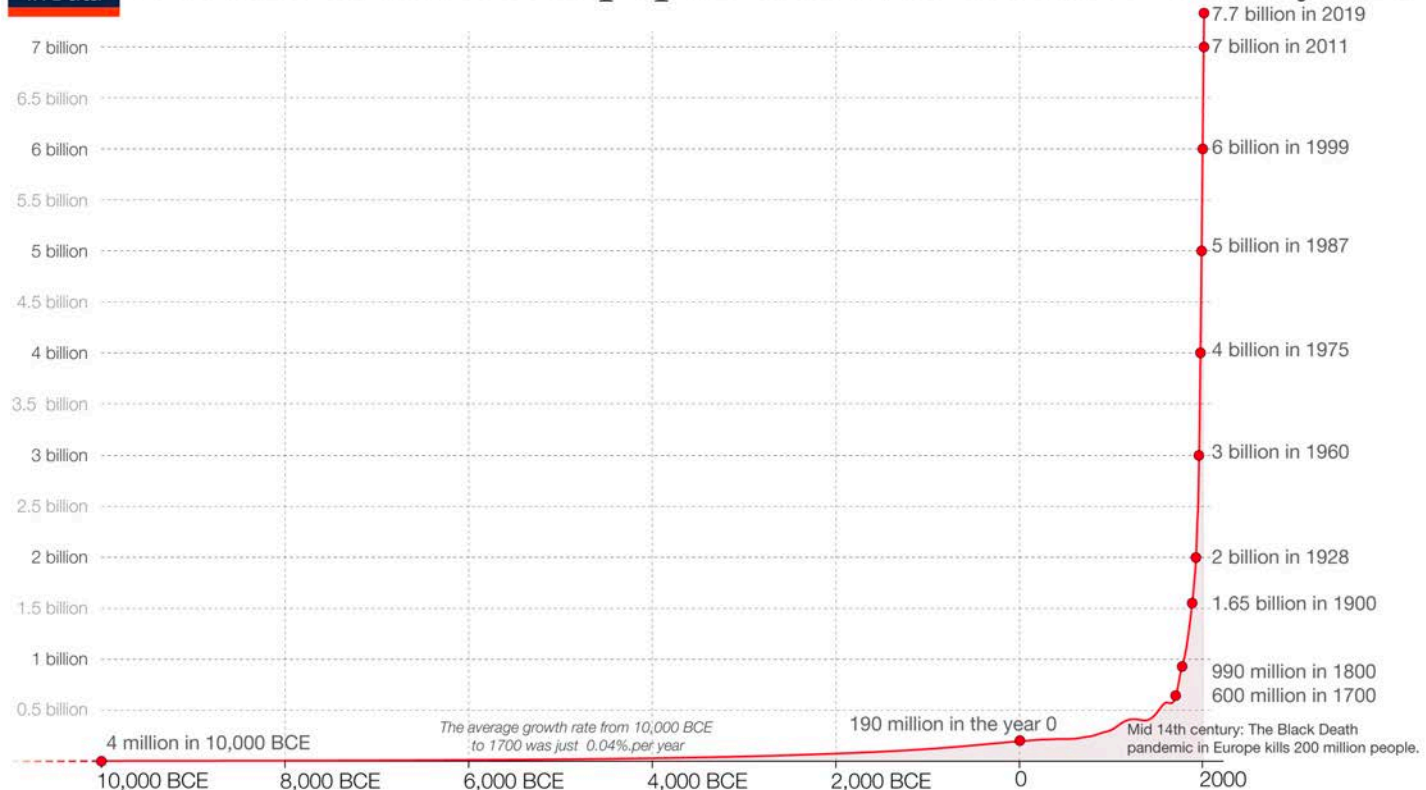
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Root Cause #1: Global Population



The size of the world population over the last 12,000 years



Based on estimates by the *History Database of the Global Environment (HYDE)* and the United Nations. On [OurWorldinData.org](https://ourworldindata.org) you can download the annual data.

This is a visualization from [OurWorldinData.org](https://ourworldindata.org), where you find data and research on how the world is changing.

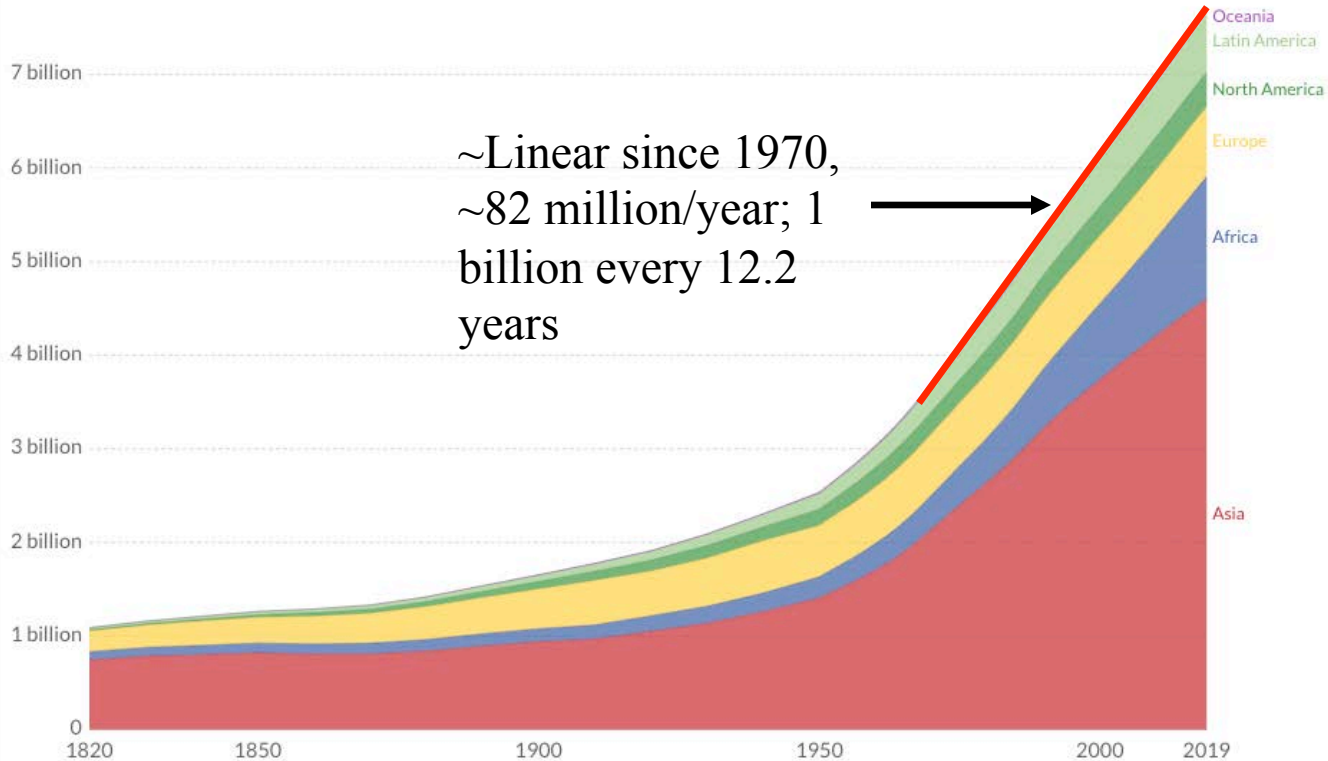
Licensed under [CC-BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) by the author Max Roser.

<https://ourworldindata.org/world-population-growth> Accessed 2019-12-28

Global Population Growth by Region

World population by region

Our World
in Data



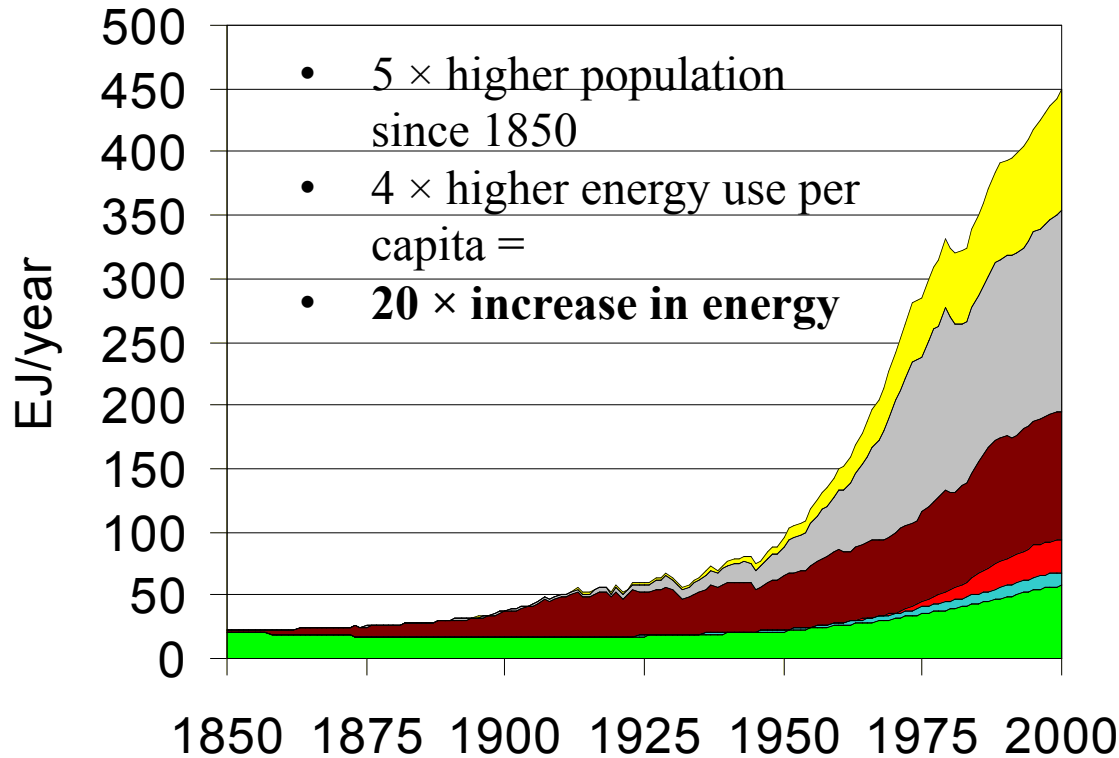
~Linear since 1970,
~82 million/year; 1
billion every 12.2
years

Source: HYDE (2016) & UN (2019)
OurWorldInData.org/world-population-growth/ • CC BY

<https://ourworldindata.org/world-population-growth> Accessed 2019-12-28

World Energy 1850-2000

Root cause #2: Fossil fuels

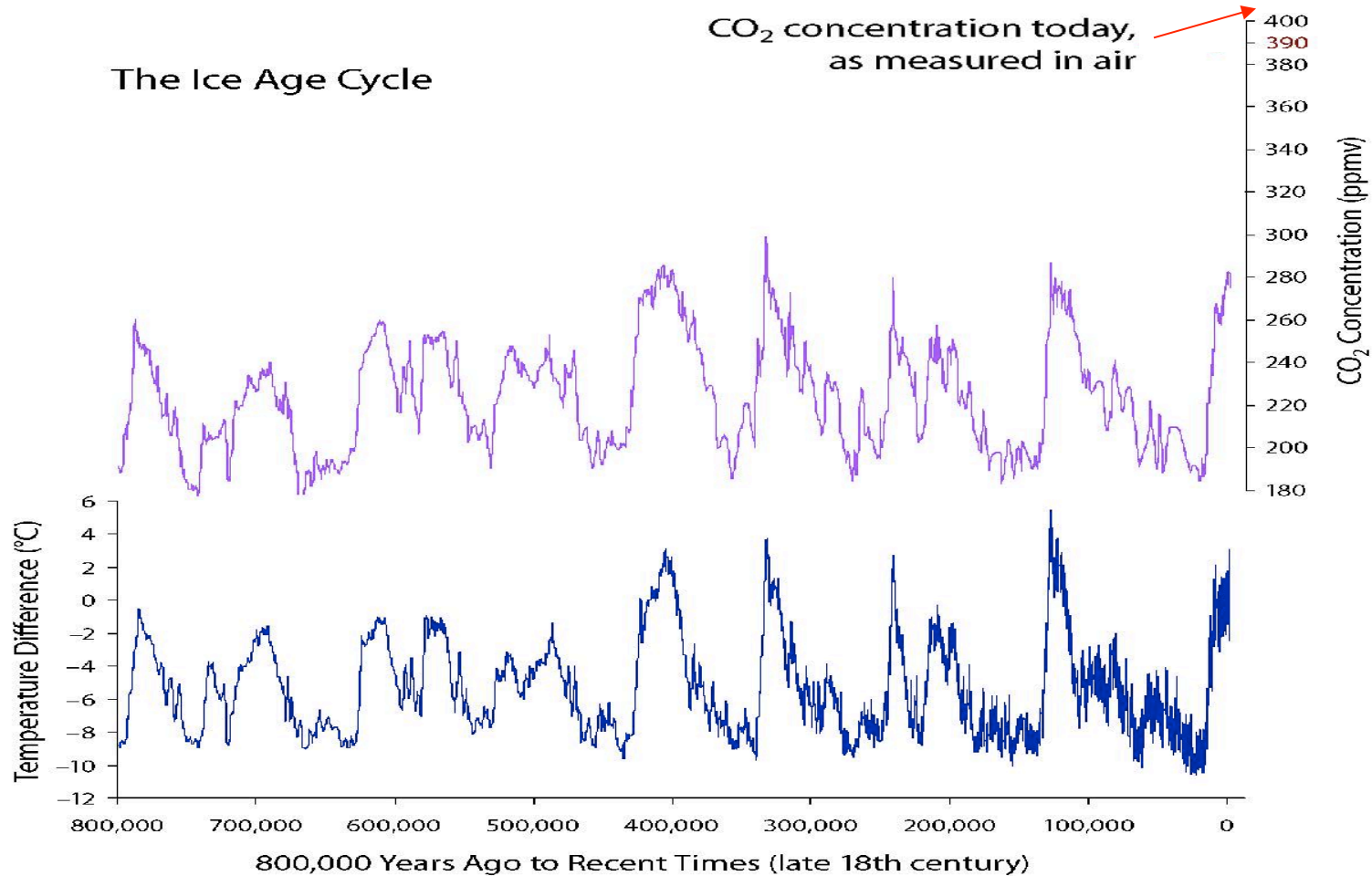


EJ= Exajoules = 10^{18} Joules

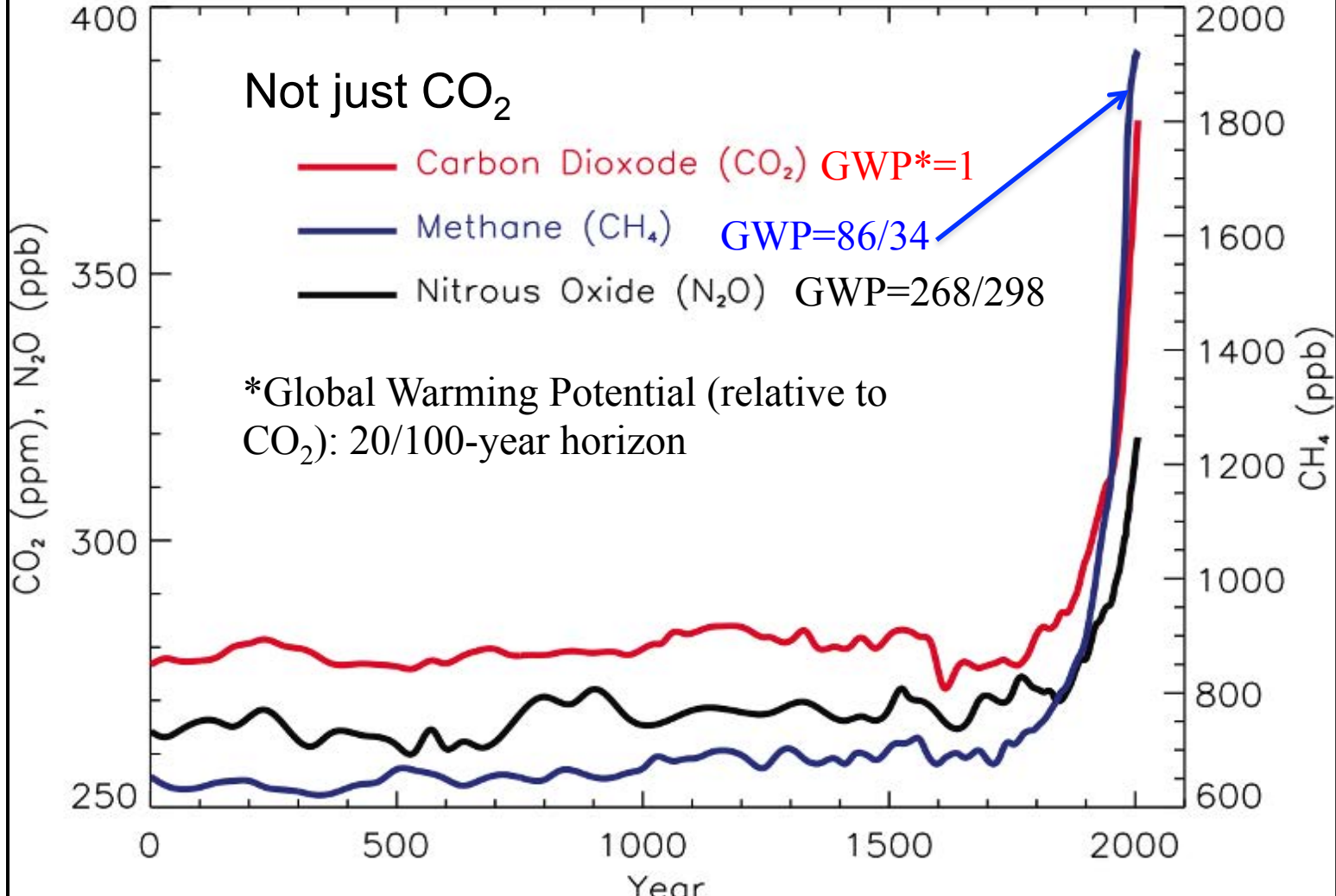
Kennedy,
Donald and
the Editors
of Science
Magazine,
State of
the Planet
2008-2009

CO₂ and Temperature, Last 800K Years

The Ice Age Cycle



Concentrations of Greenhouse Gases from 0 to 2005



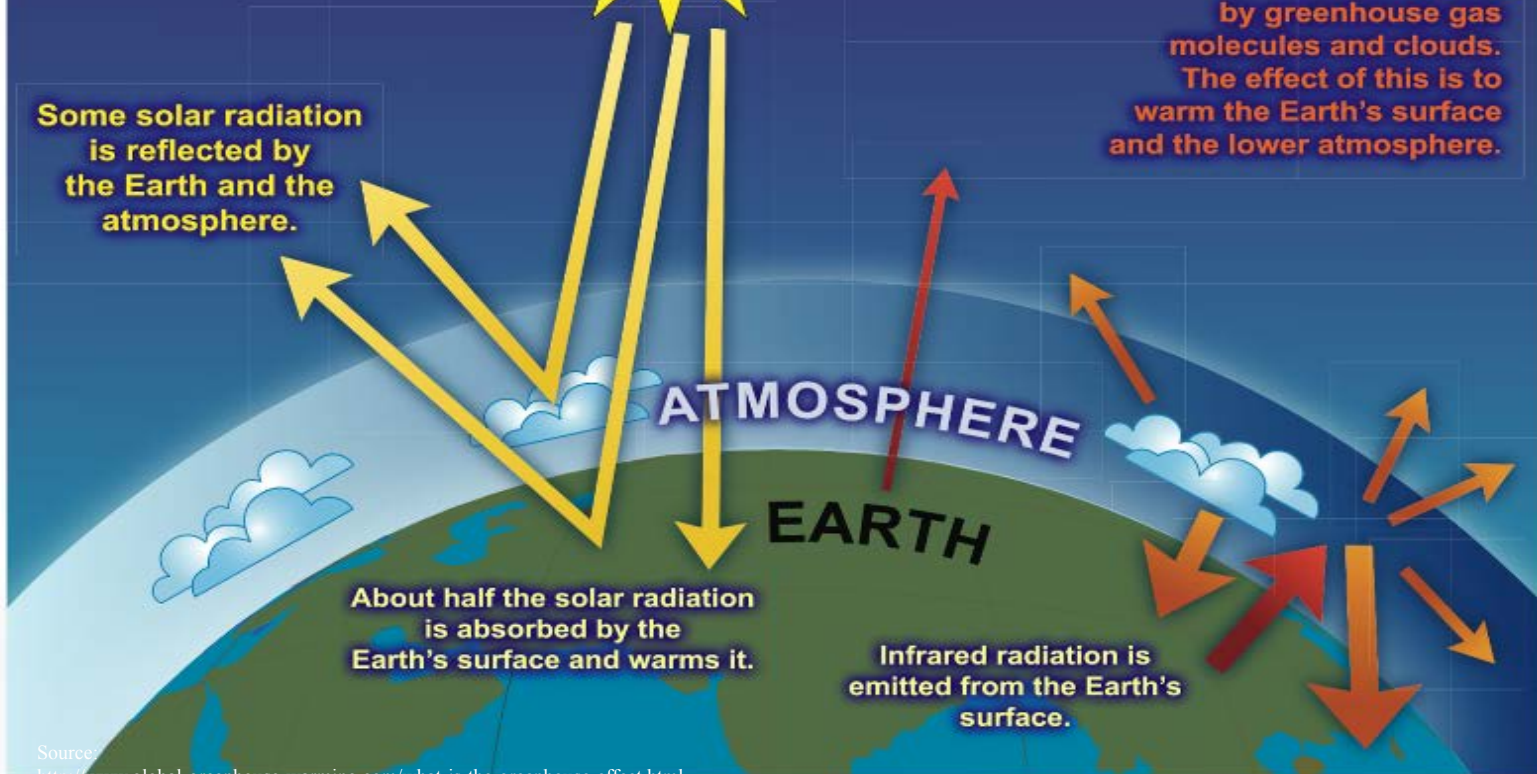
Solar radiation powers the climate system.



The Greenhouse Effect

Some of the infrared radiation passes through the atmosphere but most is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. The effect of this is to warm the Earth's surface and the lower atmosphere.

Some solar radiation is reflected by the Earth and the atmosphere.



About half the solar radiation is absorbed by the Earth's surface and warms it.

Infrared radiation is emitted from the Earth's surface.

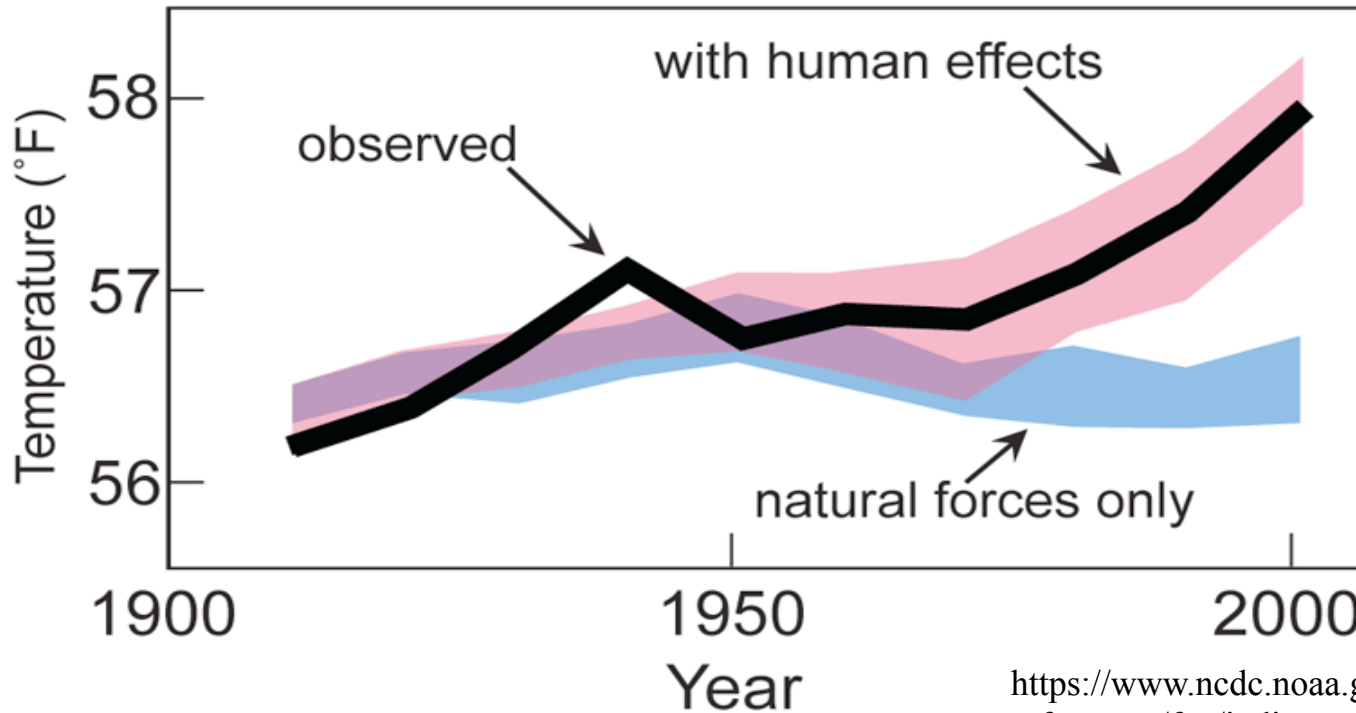
Source: <http://www.global-greenhouse-warming.com/what-is-the-greenhouse-effect.html>



Root Cause #3: Market failure

- **"Climate change is a result of the greatest market failure the world has seen...The problem of climate change involves a fundamental failure of markets: those who damage others by emitting greenhouse gases generally do not pay."**
---Stern Review on the Economics of Climate Change

How do we know we're causing it? Global Average Temperature Models



- Observations
- Models using only natural forces
- Models using both natural and human forces

<https://www.ncdc.noaa.gov/monitoring-references/faq/indicators.php>



Models of what's to come

- Best science summary from Intergovernmental Panel on Climate Change (IPCC)
- 5th Assessment Report (AR-5) released 10/1/13: 130 countries, 450 lead authors, 2500 expert reviewers, all volunteers
- Peer review process - high level of transparency and scrutiny
- Google “IPCC”

Example of modeling climate change

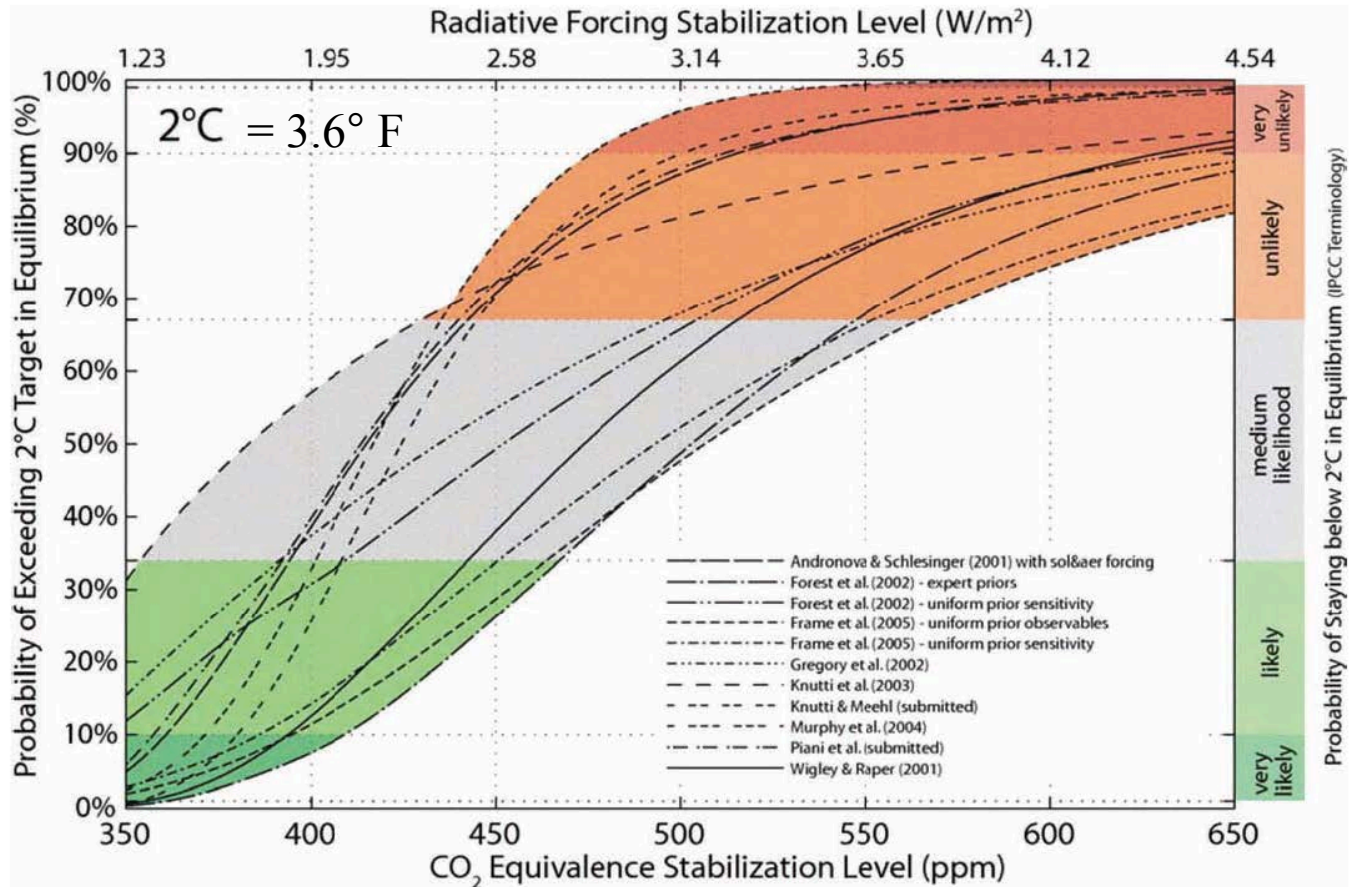
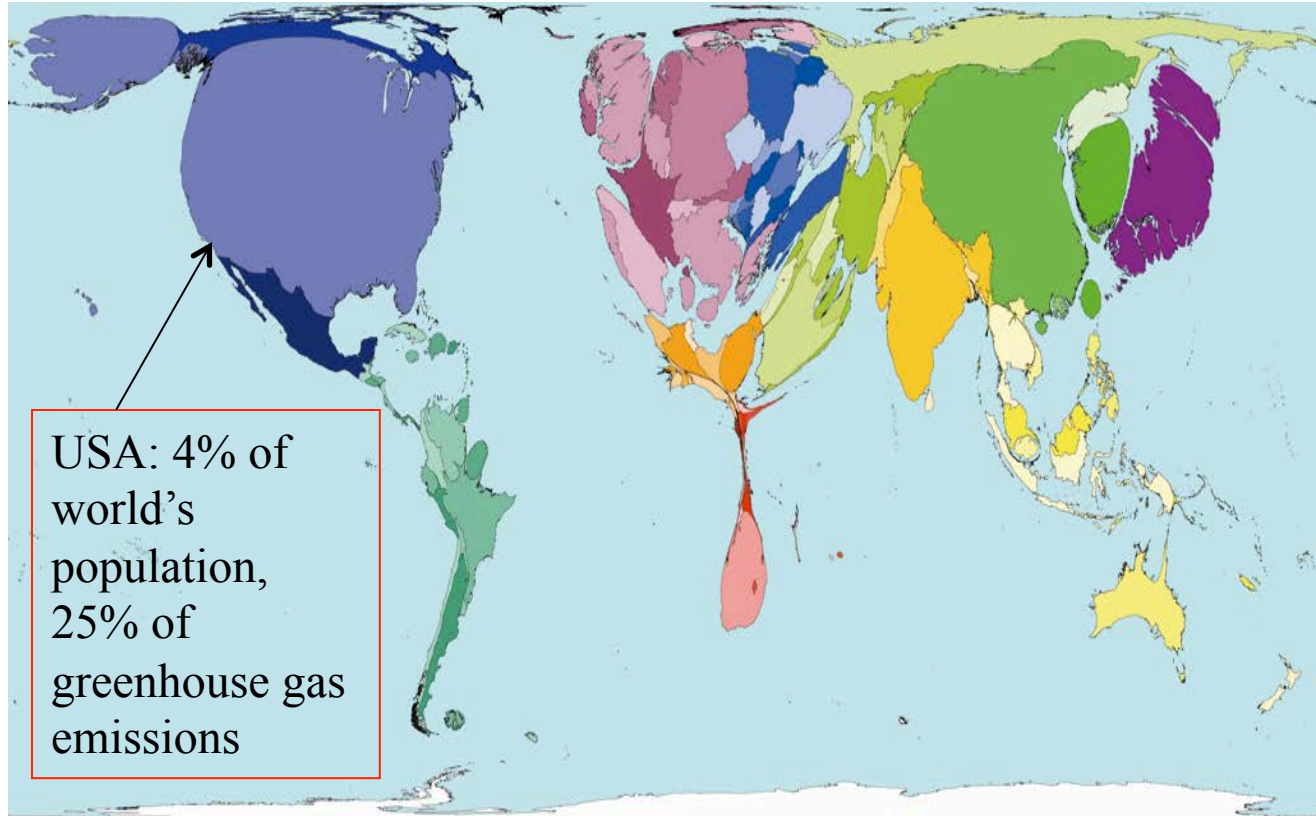


Figure 19.1. Probability (see 'Key caveat' above on low confidence for specific quantitative results) of exceeding an equilibrium global warming of $2^{\circ}C$ above pre-industrial ($1.4^{\circ}C$ above 1990 levels), for a range of CO₂-equivalent stabilisation levels. Source: Hare and Meinshausen (2005).

We are causing it (unequally)...



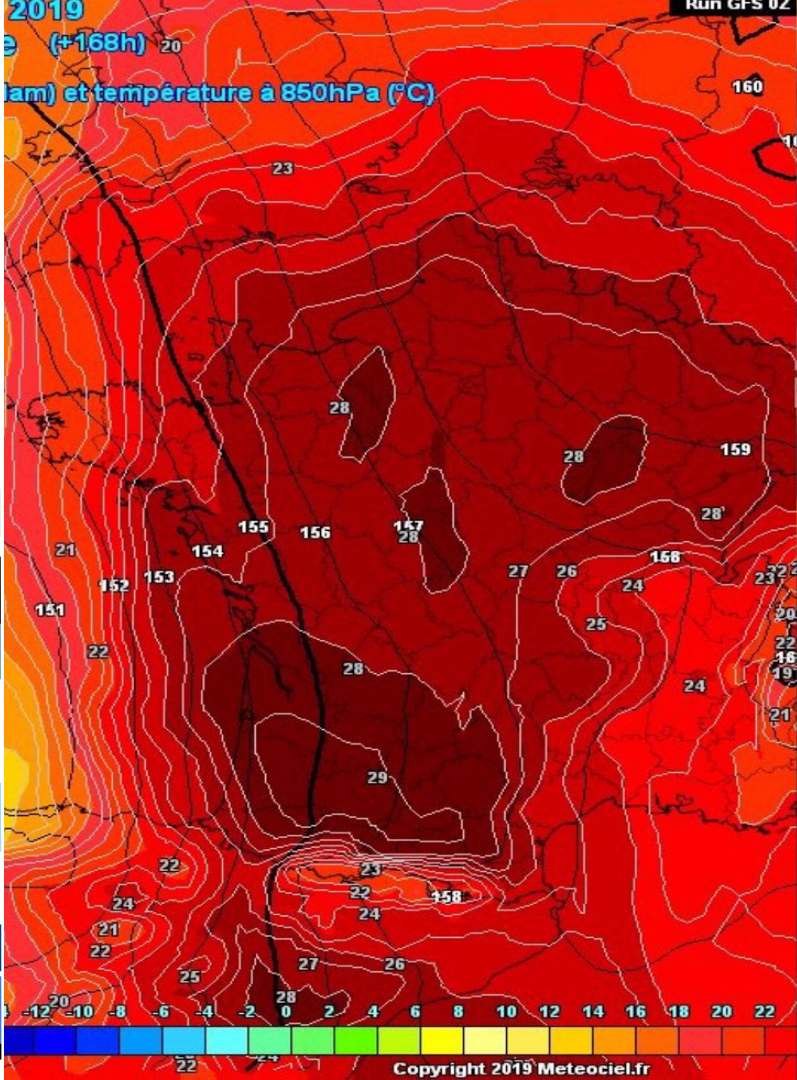
Carbon emissions, 2000

<http://www.worldmapper.org/display.php?selected=295>



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A 'screaming' weather map basically captures France's extreme heat

<https://www.cnn.com/2019/06/26/europe/france-heat-map-intl/index.html>

(Kristy will focus on heat waves.)

Increase in Wildfires

- Increased particulate pollutants and ozone
- Most vulnerable: elderly, children, people with respiratory illnesses
- 2018 California wildfires worst ever recorded
 - 101 DEATHS
 - Record poor air quality
- Drs. John Balmes and Katherine Gundling May 26



Santa Rosa, 2017

Infectious Diseases

- Increased geographical range and risk of vector-borne diseases
- We are now seeing *Aedes* (non-native) mosquitoes in California. (Mnemonic: CD YZ)
 - Chikungunya
 - Dengue
 - Yellow Fever
 - Zika
- Waterborne illnesses due to flooding, societal disruption (e.g., cholera)



Aedes aegypti

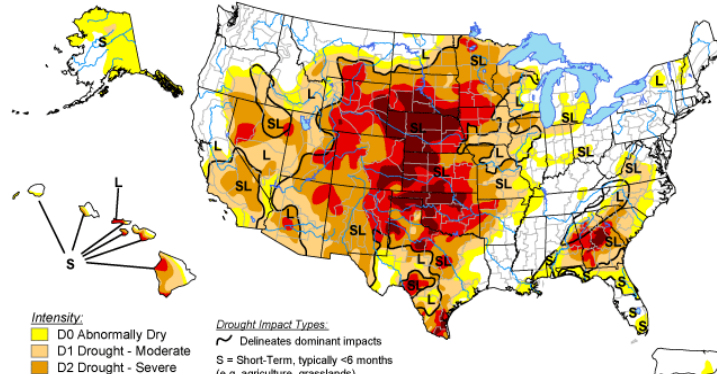
More Droughts

- Loss of summer arctic cooling of Northern Hemisphere
- Lower crop yields, food insecurity, malnutrition, disease, population displacement, armed conflict

U.S. Drought Monitor

January 15, 2013

Valid 7 a.m. EST



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://droughtmonitor.unl.edu/>



Released Thursday, January 17, 2013

Author: David Simeral, Western Regional Climate Center



Without Water, Revolution

By THOMAS L. FRIEDMAN

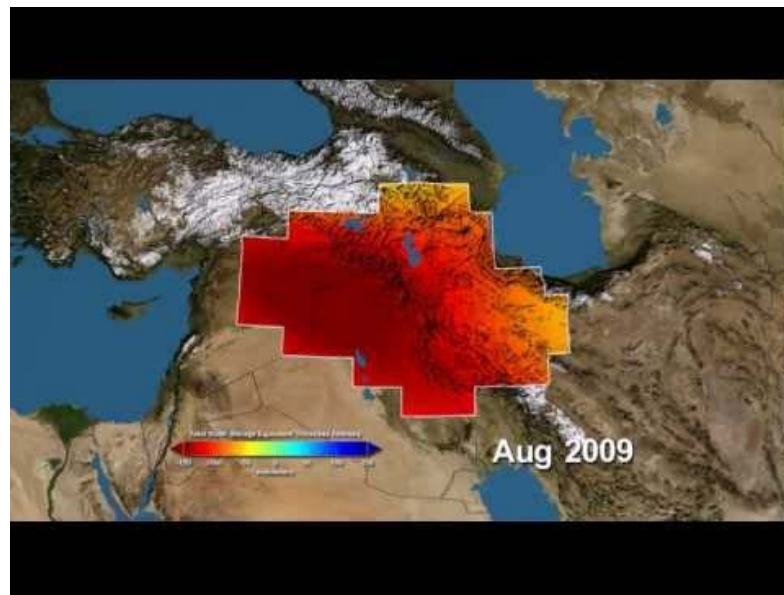
NYT: May 18, 2013

TEL ABYAD, Syria — “...between 2006 and 2011, some 60 percent of Syria’s land mass was ravaged by the drought and, with the water table already too low and river irrigation shrunken, it wiped out the livelihoods of 800,000 Syrian farmers and herders...”

Satellites Reveal Depletion of a Vital Middle East Water Supply

By ANDREW C. REVKIN

NYT: February 12, 2013



Increased Storms and Flooding



- Direct injuries and deaths
- Contaminated water supplies
- Increased risk of infectious diseases
- Long term psychological effects
- Financial losses, poverty: 2017 U.S. Hurricane damage*:
 - Harvey: \$180 billion
 - Irma: \$ 175 billion
 - Maria: \$ 50 billion

*<https://www.cnn.com/2017/10/10/weather/hurricane-nate-maria-irma-harvey-impact-look-back-trnd/index.html>



Respiratory disease, asthma and allergies

- Longer pollen season with higher counts
- Mold and mildew in houses after flooding
- Smoke from fires → low air quality
- Higher temperatures → higher ozone levels → increased respiratory mortality

Crowley RA. Climate Change and Health: A Position Paper of the American College of Physicians. *Annals of Internal Medicine* 2016;164:608-10

Jerrett et al. Long-Term Ozone Exposure and Mortality *NEJM* 2009;360:1085-90



Psychological effects

- Post-traumatic stress disorder (e.g., after natural disasters)
- Depression
- "Eco-anxiety"

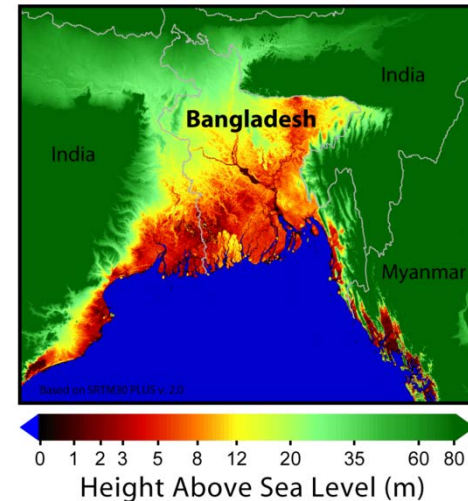
- Dr. Robin Cooper to discuss on June 2

Sea Level Rise

- More coastal flooding during storms
- Saltwater intrusion into fresh water supplies
- Population displacement, refugees, armed conflict
- Over the last 3 million years when temps were 2-3° C higher, sea levels were 6 meters higher*

*IPCC AR-5

Sea Level Risks - Bangladesh

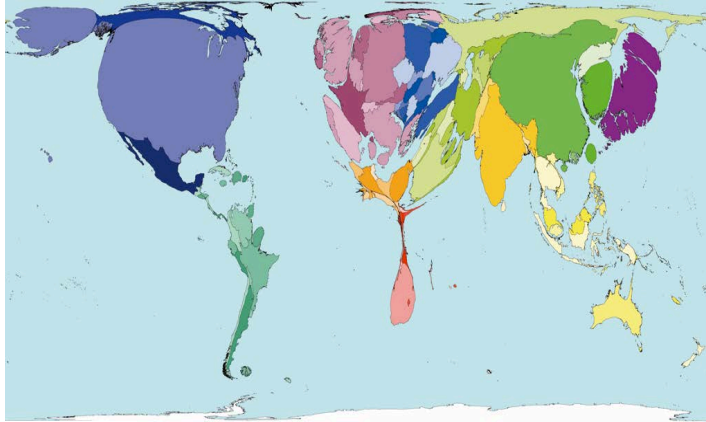




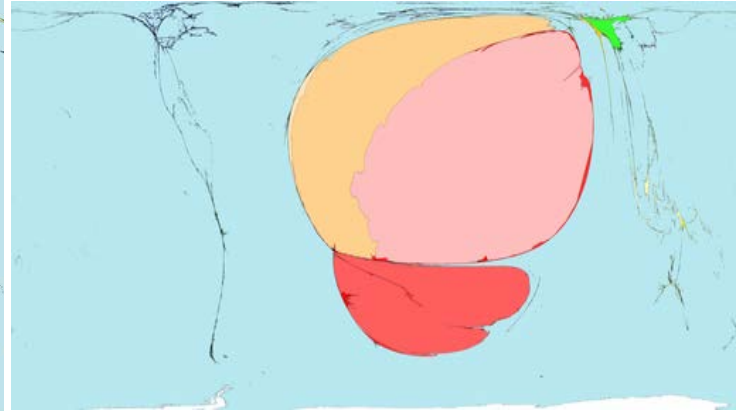
Stand Up For Science Demonstration in SF, 12/13/16

Who is affected?

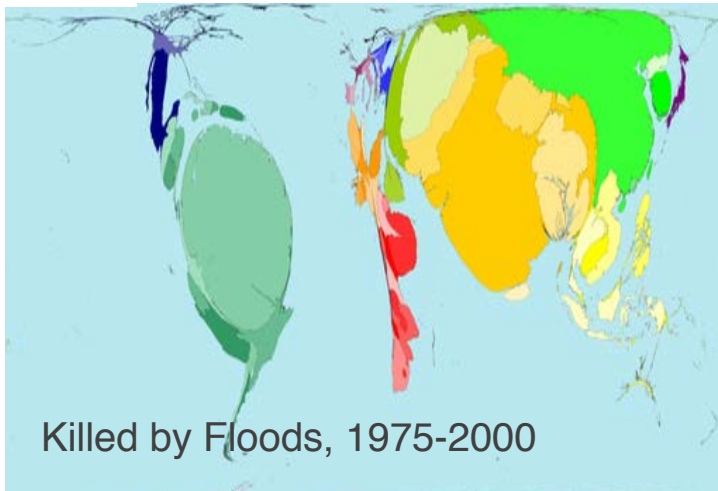
www.worldmapper.org



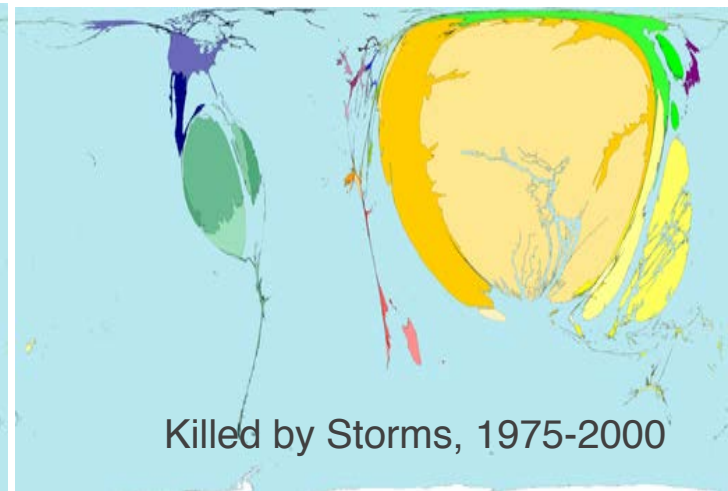
Carbon emissions, 2000



Killed by Drought, 1975-2000



Killed by Floods, 1975-2000



Killed by Storms, 1975-2000



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Estimating your carbon footprint

- Many online calculators
- Best ones include food, show effects of changes you can make, and are state-specific
- Google “Carbon footprint calculator”
 - (I recommend The Nature Conservancy site.)
 - Also Google “Footprint Network”
- Per capita US carbon footprint ~21 tons

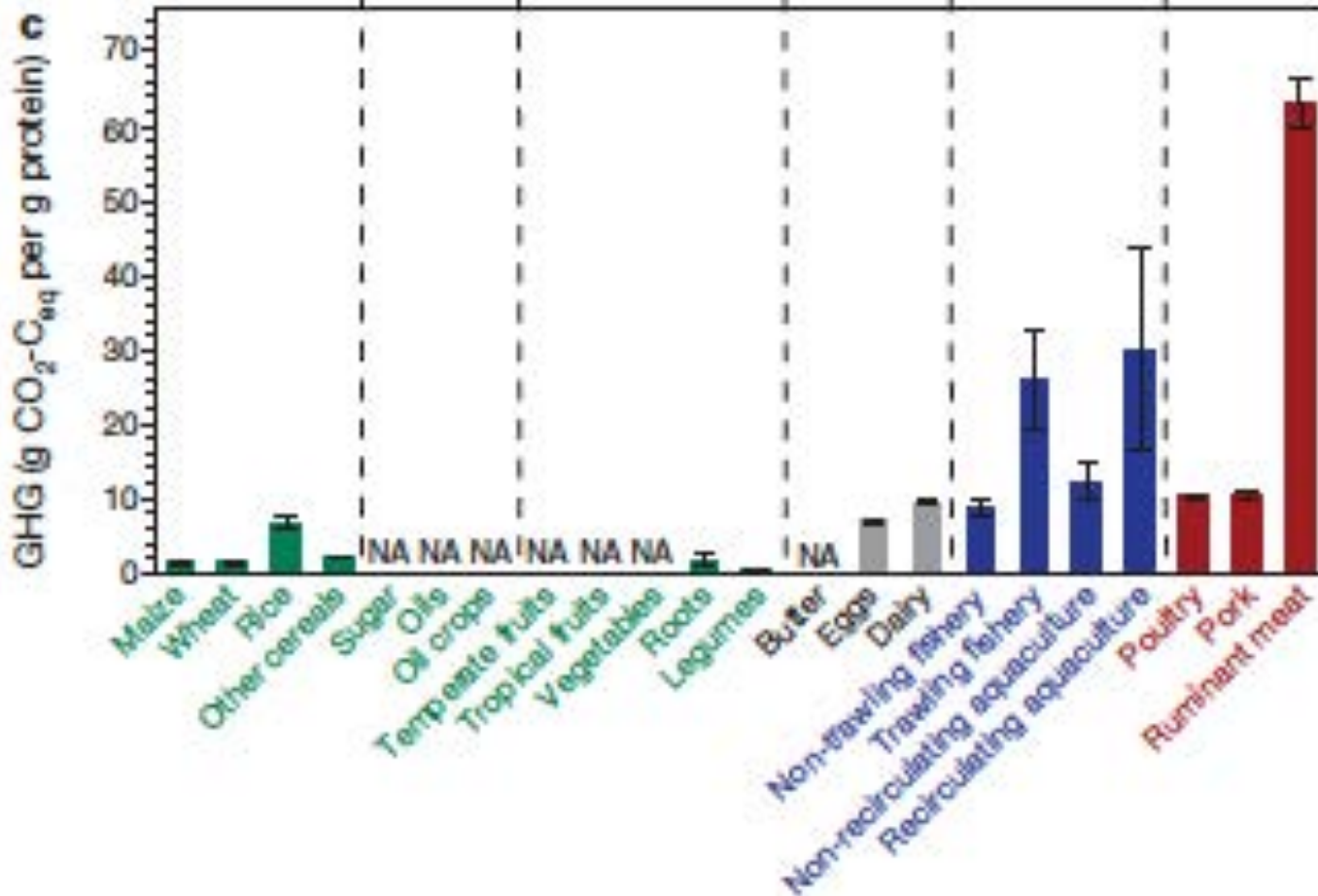




Importance of airplane travel

- 1 East Coast round trip from California = 1-2 tons CO₂
- Typical California per capita household electricity consumption ~ 3 tons CO₂
- Reduce travel by
 - Combining trips
 - Skipping trips
 - Videoconferencing, Skype, Zoom, etc.
- Consider offsetting your travel

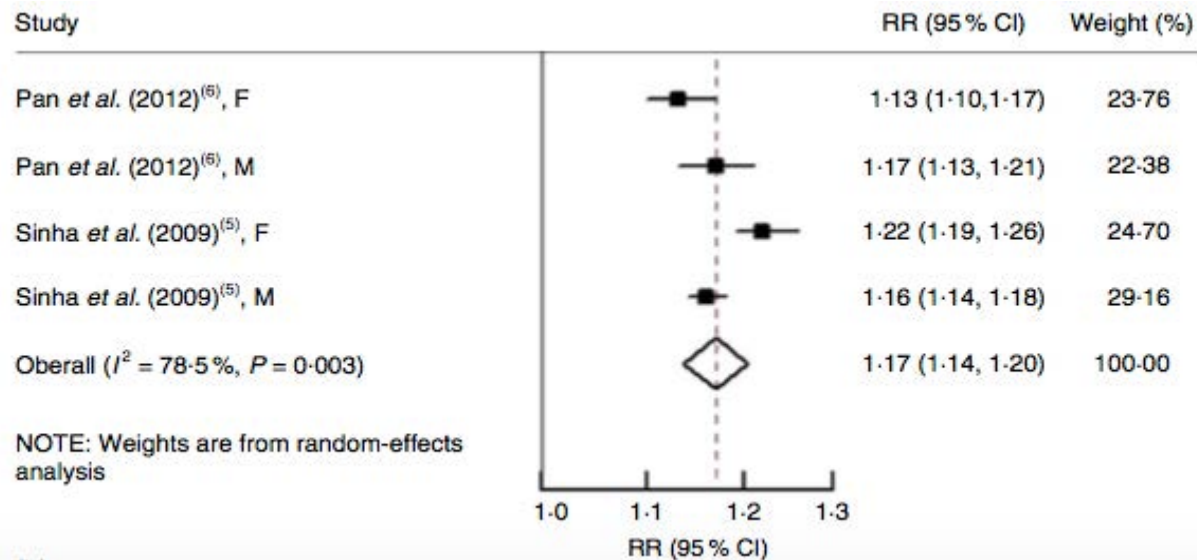
GHG footprint of foods per gram protein



Tilman D,
Clark M.
Nature, 2014;
515:518-22

Co-benefit of eating less meat: living longer

Fig. 3 Risk of all-cause mortality associated with each serving per day of total meat



Wang X *et al.* Red and processed meat consumption and mortality: dose-response meta-analysis of prospective cohort studies. *Public Health Nutrition* 2016; 19:893-905



<https://sustainability.ucsf.edu/3.690>



- About Us / Contact Us
- Review Metrics & Annual Reports
- Greening the Medical Center
- Get Involved
- Stay Informed
- Recycling & Waste Reduction



Feature Stories

Get Inspired! »

Deborah Fleischer, Green Impact, September 2017



Sustainability Video Picks 2018

Sustainability Videos (2011-2017)

UCSF Sustainability Stories »

Huge Energy and Dollars Savings in Labs
March 3, 2019

Five Ways UC Shines in its 2018 Annual Sustainability Report
February 2, 2019

UCSF Faculty Act on Climate-Health Connection
February 2, 2019

UCSF's FY18 Annual Sustainability Report: A Year of Connecting Health and Climate Change
January 1, 2019

Quicklinks

- [Cool Campus Challenge](#)
- [Million Light Bulb Challenge](#)
- [Print Management](#)

Medical Students Call on UCSF Departments to Go Beef and Lamb-Free



HEALTH CARE'S CLIMATE FOOTPRINT

HOW THE HEALTH SECTOR CONTRIBUTES TO THE GLOBAL CLIMATE CRISIS AND OPPORTUNITIES FOR ACTION



- 4.4% of world's greenhouse gas emissions
- If healthcare were a country, it would be the 5th largest producer of GHG



Improve Healthcare Value

- An estimated 30% of US healthcare spending is **waste**^{1,2}
- This amounts to > \$3000 per person per year!
- Discretionary funding for ANYTHING (including infrastructure, conservation, renewable energy) severely constrained by healthcare costs
- *Trying to reduce the environmental footprint from healthcare without examining what we do is like trying to reduce our footprint from travel without considering what trips we take.*
-- Academic Senate Sustainability Committee, 2009
- Learn more at my June 3 talk "Safely Doing Less," part of the Mini Med School course "What's Next?"

¹.Shrank WH, Rogstad TL, Parekh N. Waste in the US Health Care System: Estimated Costs and Potential for Savings. *JAMA*. 2019;322(15):1501–1509. ~25%, but excludes administrative waste

Berwick DM, Hackbarth AD. Eliminating Waste in US Health Care. *JAMA*. 2012;307(14):1513–1516. Midpoint 34%

Divestment movement



Seattle City Employees' Retirement System (SCERS) divesting \$17.6 million, 12/21/12

- “If it's wrong to wreck the climate then it's wrong to profit from that wreckage.” – Bill McKibben, 350.org
- Fossil Free UC started by students in 2012
- UCSF Academic Senate Sustainability Committee proposes a systemwide divestment memorial to the Regents, 2018
- Passed by UCSF Faculty, Feb 2019 (79% in favor).



Los Angeles Times

UC Academic Senate Calls on Regents to Divest From Fossil Fuels

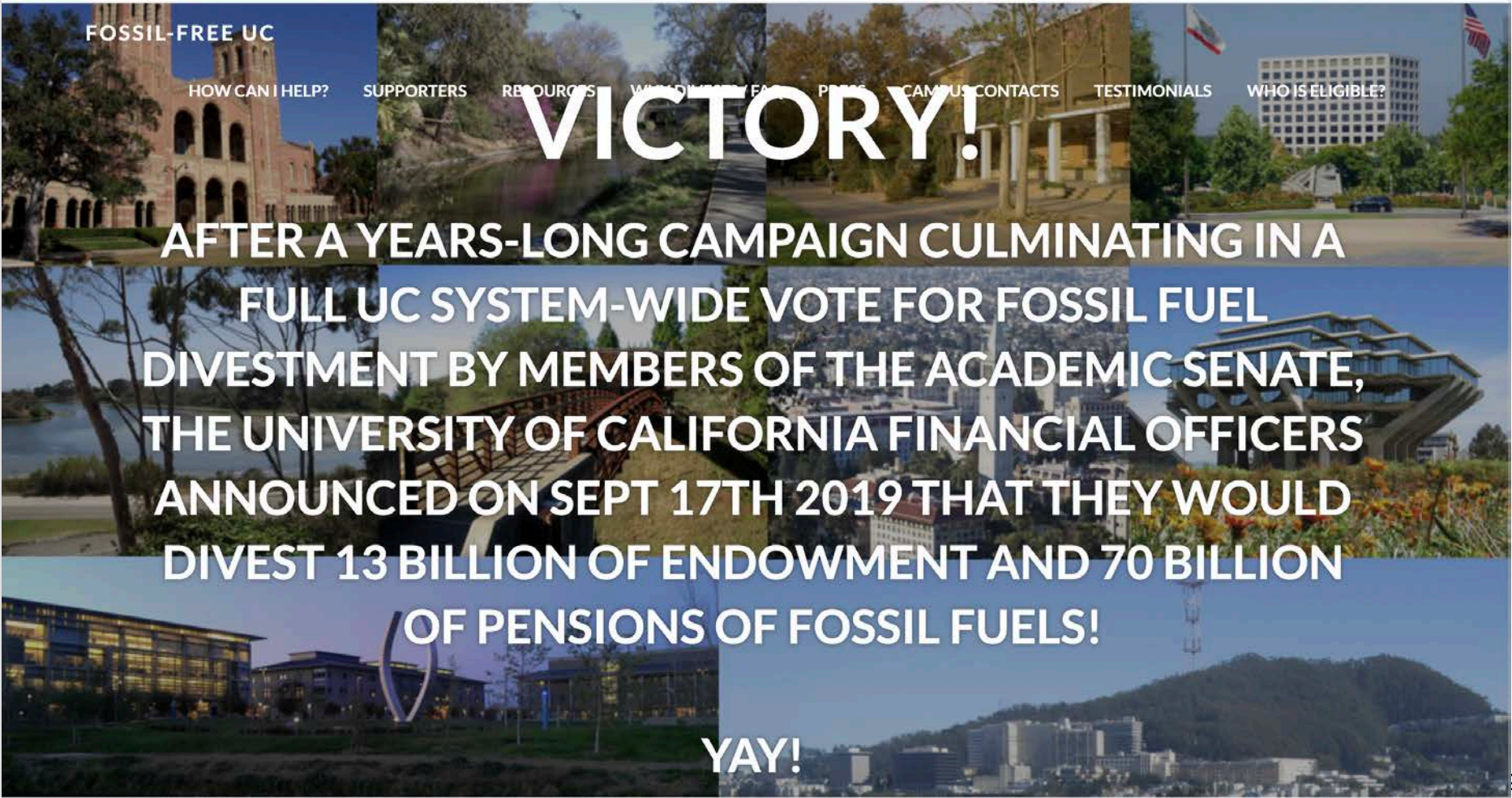
The University of California faculty-wide divestment vote drew nearly 77% support.

BY JOSHUA EMERSON SMITH,
JULY 18, 2019, 4:16 PM

VICTORY!

AFTER A YEARS-LONG CAMPAIGN CULMINATING IN A FULL UC SYSTEM-WIDE VOTE FOR FOSSIL FUEL DIVESTMENT BY MEMBERS OF THE ACADEMIC SENATE, THE UNIVERSITY OF CALIFORNIA FINANCIAL OFFICERS ANNOUNCED ON SEPT 17TH 2019 THAT THEY WOULD DIVEST 13 BILLION OF ENDOWMENT AND 70 BILLION OF PENSIONS OF FOSSIL FUELS!

YAY!





Relevance of Covid-19 – Silver lining

- Sudden drop in GHG emissions
 - Have you noticed how clear the air in the Bay Area is?
- Introduced many to videoconferencing and telehealth visits
 - UCSF Telehealth has gone from 2% to > 50% of visits.
- Opportunity to learn from mistakes
 - The argument, "We can't do what the scientists tell us to because it would be too expensive, so let's do nothing for now" has lost some credibility.



Relevance of Covid-19 – a teachable moment?*

- Science is real
 - Ignoring threats does not make them go away
- Timing is key when responding to threats
 - Covid-19 in South Korea vs USA
 - It would have been easier to deal with climate change if we had started 50 years ago
- Health professionals are a trusted voice
 - We take care of victims of bad policy decisions
 - Time to get angry and speak out

*Thanks to Bill McKibben 3/25/20, Climate Health Now! Zoom conference



We know enough to act

- Given high risks and disproportionate effects, even low probability would warrant action
- Interventions have *co-benefits*
 - Reduced air pollution, environmental degradation and international conflict from extraction and burning of fossil fuels
 - Better health from eating less meat and from walking and cycling rather than driving



Set an example

- Coworkers will notice how you get to work
- Friends and family will notice what you eat and where you go on vacation
- Colleagues will notice your business travel

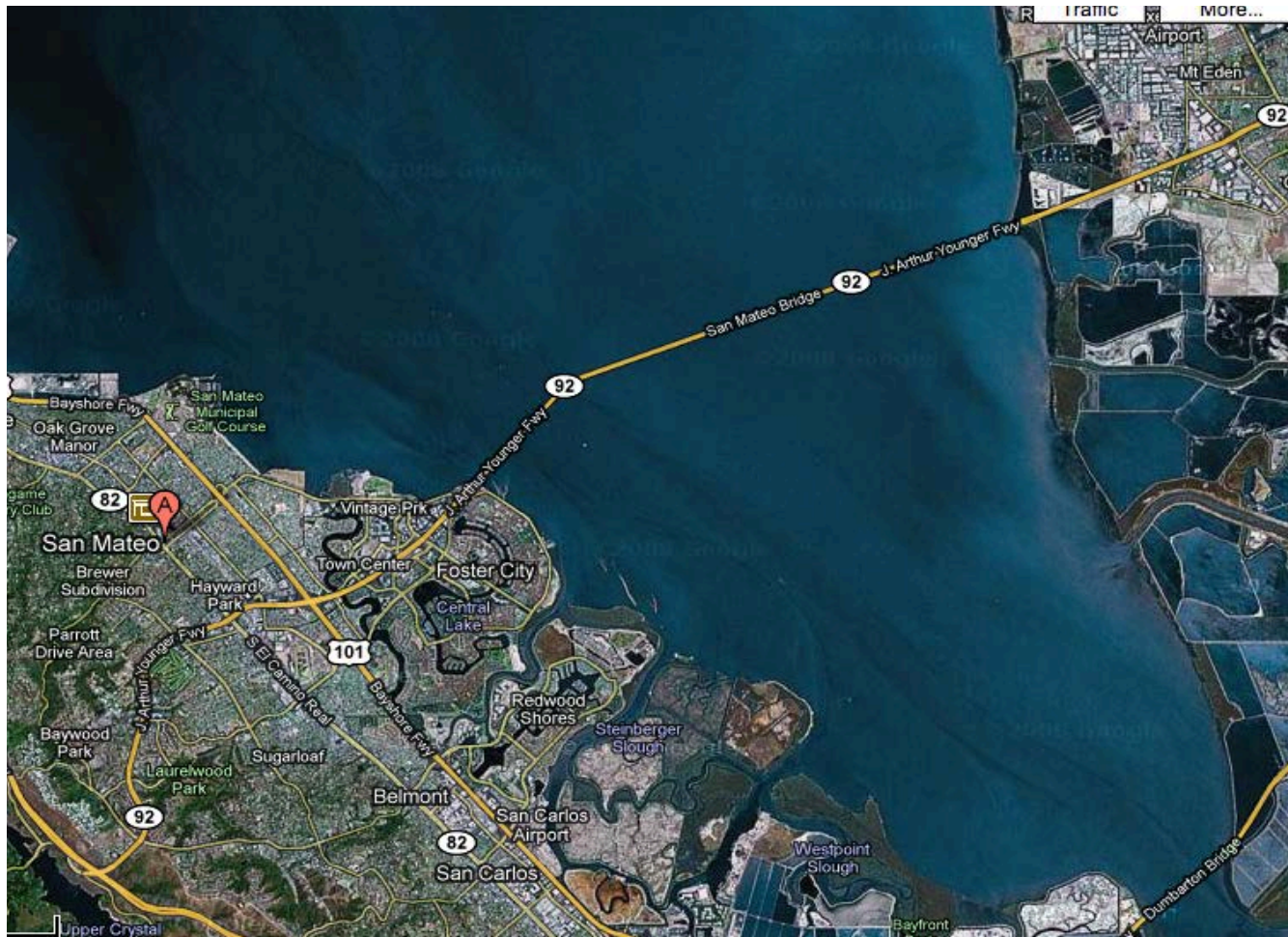
Treatment for Climate Change Despair/Eco-Anxiety

- Come together in community
 - Find allies who understand what you are feeling
- Self care
 - Mindfulness, meditation, etc.
 - Spend time in nature
- Identify what specific problems speak to you, and get to work
 - Join a group!



Dr. Robin Cooper,
UCSF Psychiatrist,
Co-founder, Climate
Psychiatry Alliance

Closing Story: San Mateo-Hayward Bridge



Existing sign outside Foster City Costco, 2001





E-mail excerpts - #1

Below is the result of your feedback form. Wednesday, September 5, 2001 at 20:41:08

On behalf of the Social Action Committee of the Unitarian Universalists of San Mateo (which thinks globally and acts locally), I'm writing to call attention to a problem that wastes time and energy.

The problem is that it is too easy accidentally to get on Highway 92 Eastbound at Foster City Blvd, and be forced to drive all the way to Hayward...



E-mail excerpts -#7

At 02:32 PM 10/22/2002 -0700, Robert_Haus@dot.ca.gov wrote:

Dear Dr. Newman:

I forwarded your remarks, once again, to the person in charge of Signing for San Mateo County...

As we said previously: Signing is a matter of balance... Too few signs can lead to confusion, but too many signs can lead to the same result...



E-mail excerpts, #28

December 12, 2004

Greetings, Mr. Haus --

I was over at the Foster City Costco this afternoon, so naturally my thoughts turned to you. How are you doing? I hope you have a happy holiday season, and don't forget that the wish of the Unitarian Universalists of San Mateo this year, as in 2001, 2002, and 2003, is that someday every trip to Hayward will be a wanted trip to Hayward.

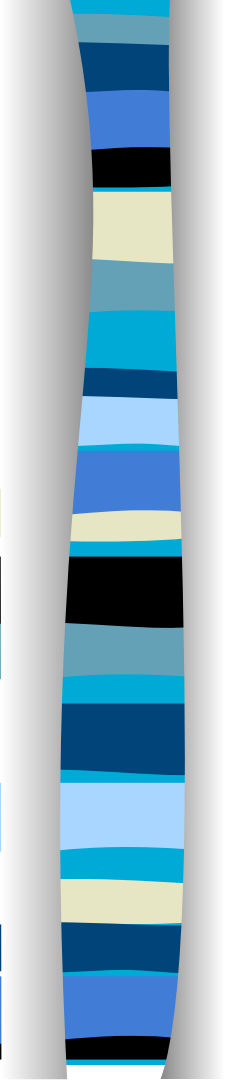
Will our wish someday come true? You could make it happen.

Entrance to San Mateo Bridge (before)



Entrance to San Mateo Bridge
(March, 2006,
after 4.5 years
and ≥ 37 e-
mails)





LAST EXIT



Foster City
Boulevard
1/2 MILE





Summary

- Climate change poses grave threats to health of people and the planet
- Healthcare contributes because of its own large footprint and its costs
 - Improve healthcare value
- You can reduce your own environmental footprint by conserving energy, reducing travel, eating less meat, and offsetting carbon
- **This will not be enough. We all need to become change agents!**
 - **JOIN A GROUP!**
- There are CO-BENEFITS



CLIMATE SUMMIT

WHAT IF IT'S A BIG HOAX AND WE CREATE A BETTER WORLD FOR NOTHING?

- ENERGY INDEPENDENCE
- PRESERVE RAINFORESTS
- SUSTAINABILITY
- GREEN JOBS
- LIVABLE CITIES
- RENEWABLES
- CLEAN WATER, AIR
- HEALTHY CHILDREN
- ETC. ETC.



YOLU PETT

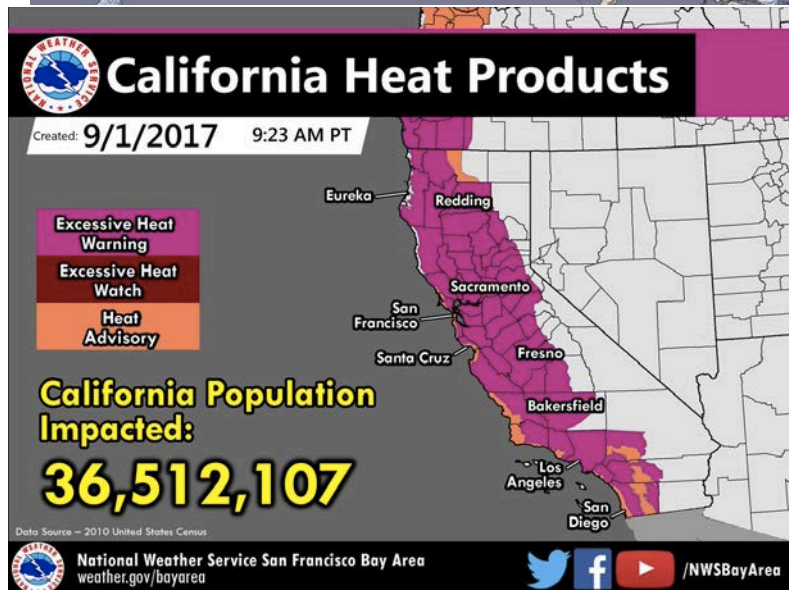
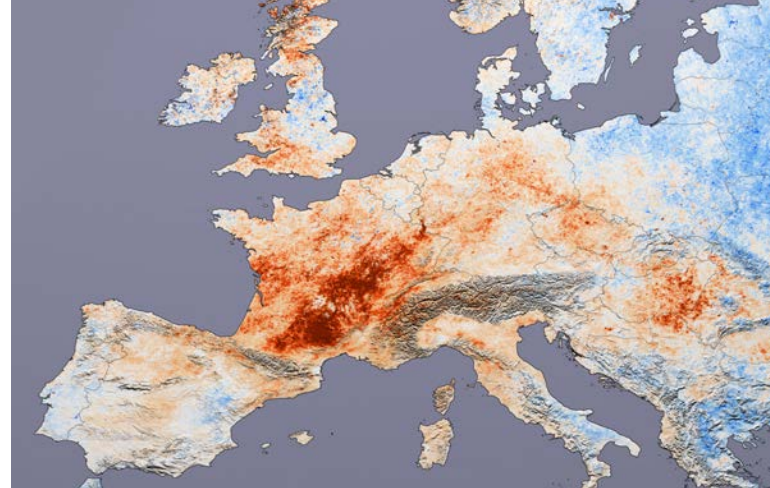


Heat Waves

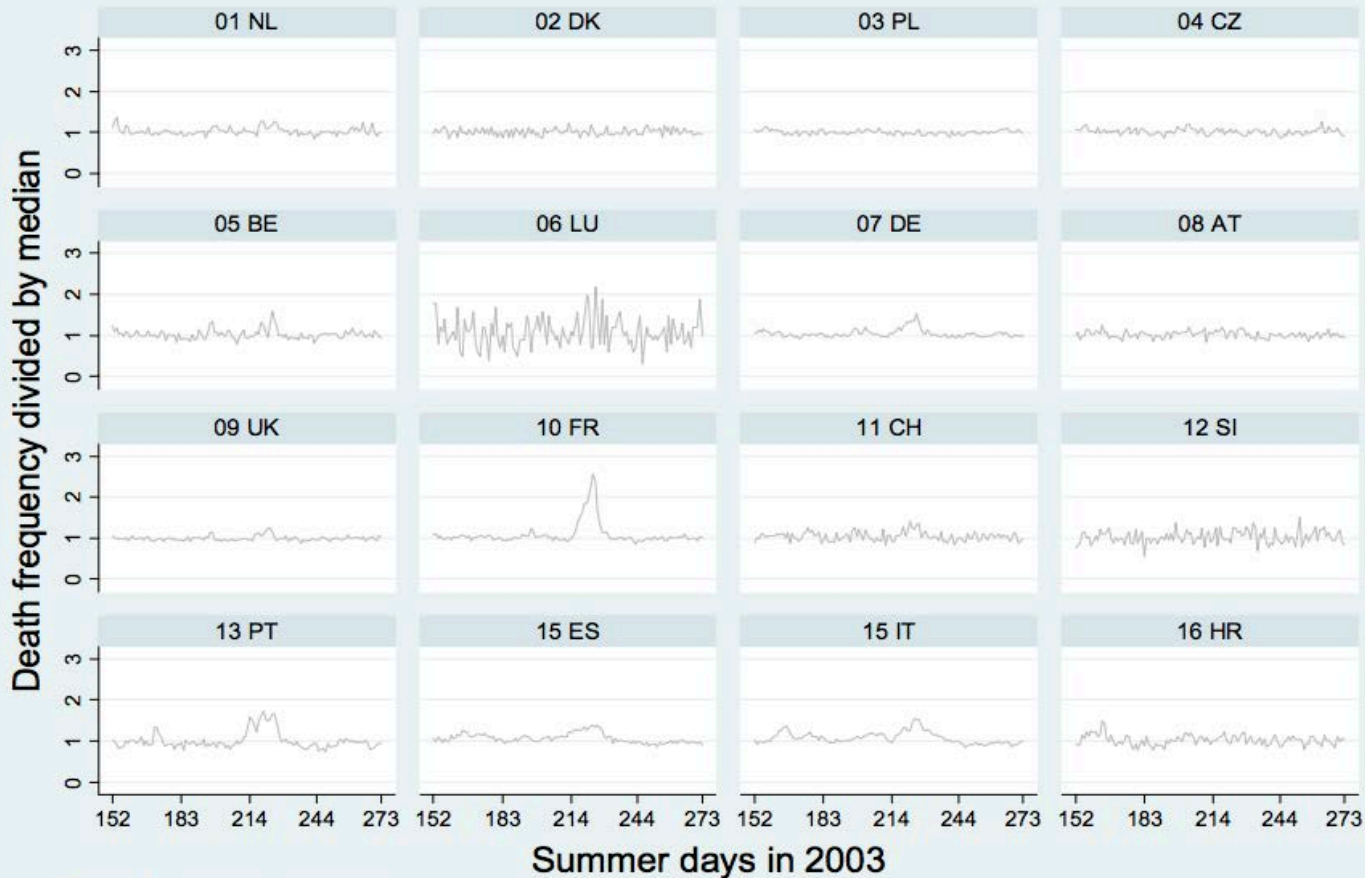
- 2003 European heat wave¹
 - Excess deaths > 80,000
- 2010 Eastern Europe and Russian heat wave²
 - broke 500-year temperature records
 - 55,000 excess deaths in Russia alone
- 2017 San Francisco's hottest day ever recorded (9/1, 106 degrees F)³
 - Moffitt hospital no air conditioning!

1. Robine JM et al. 2003 Heatwave project.
2. Barriopedro et al. Science 2011;332:220; <http://www.reuters.com/article/us-russia-heat-deaths-idUSTRE69O4LB20101025>
3. www.washingtonpost.com/news/capital-weather-gang/wp/2017/09/01/san-francisco-smashes-all-time-record-high-temperature-hits-106-degrees/

NASA



Deaths during European heat wave of 2003



Graphs by Geo sequence

: http://ec.europa.eu/health/ph_projects/2005/action1/docs/action1_2005_a2_15_en.pdf