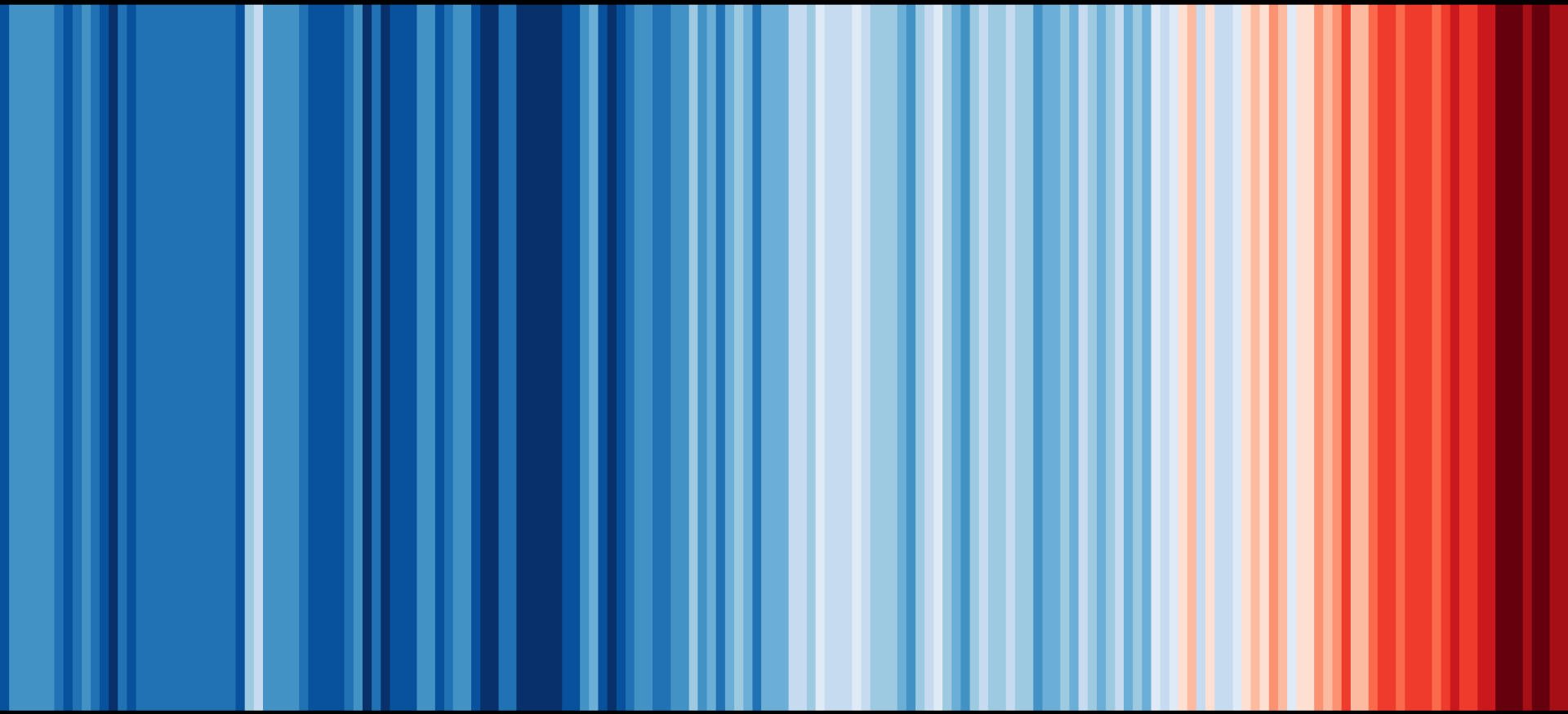
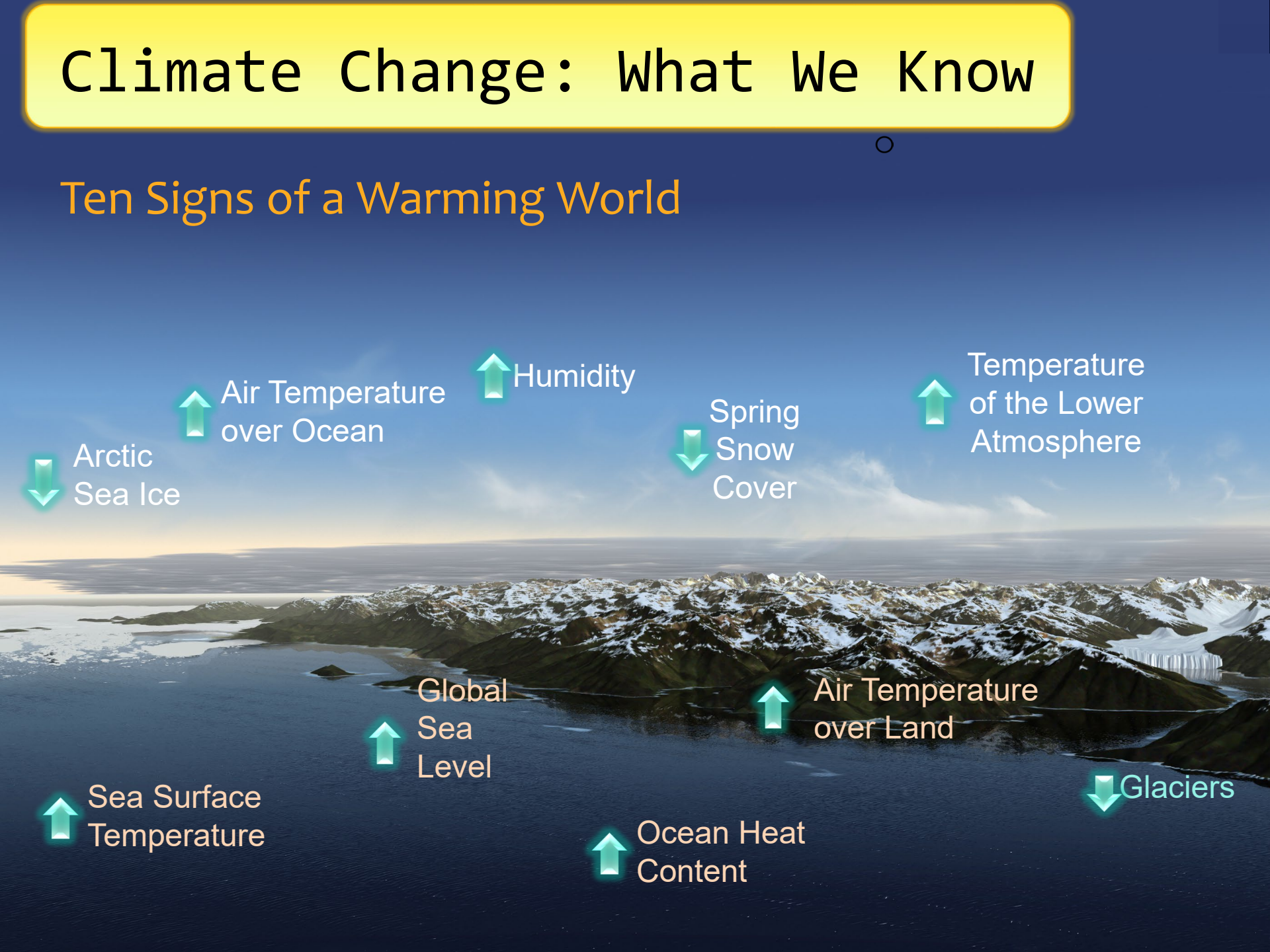
Climate Change in the United States and Beyond

Global temperature change (1850-2022)



Climate Change: What We Know

Ten Signs of a Warming World

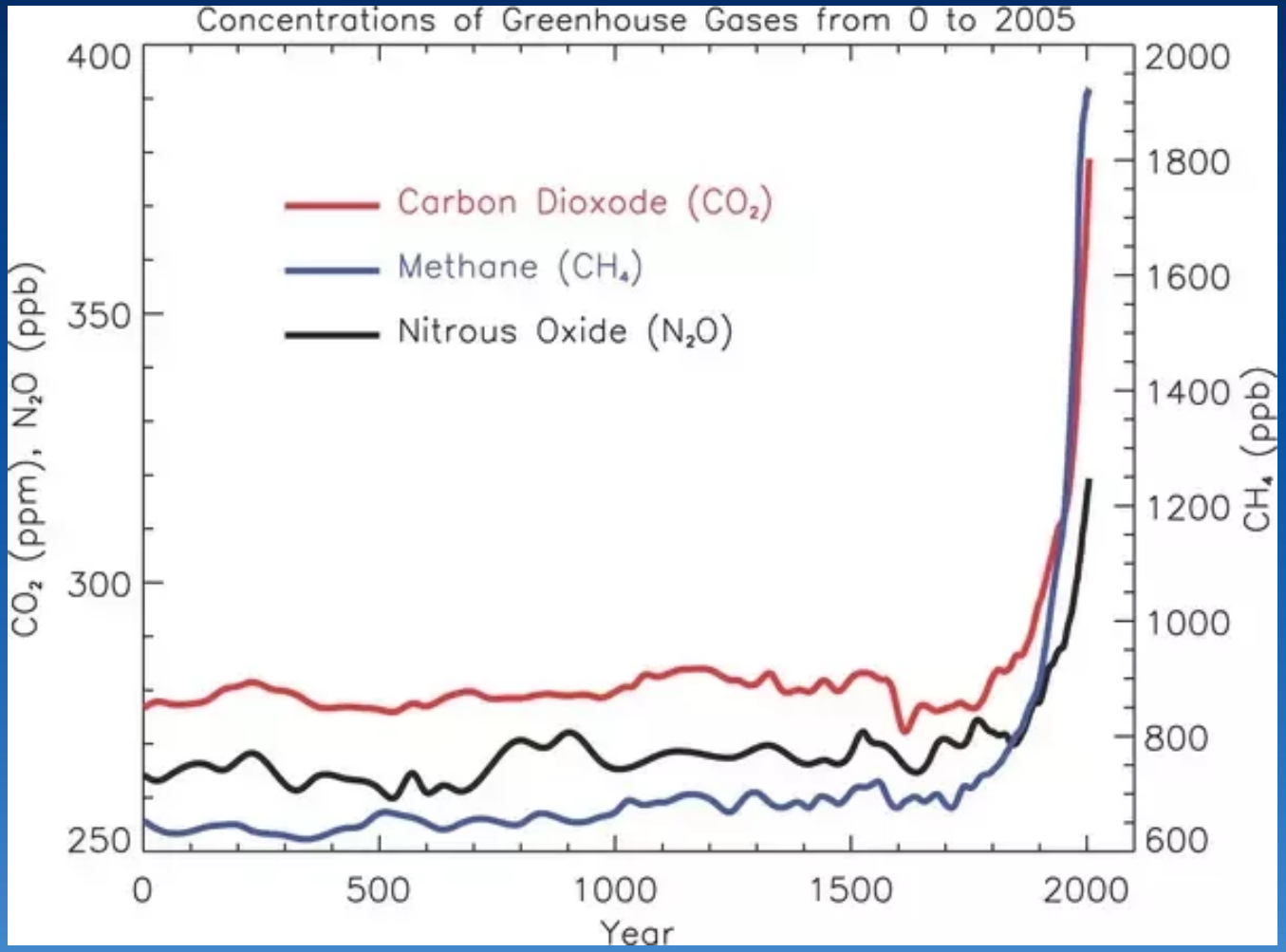


How long have we known?

In 1856 Eunice Newton Foote, an American scientist, and inventor from Seneca Falls, New York became the first scientist known to experiment on the warming effect of sunlight on different gases. She theorized that changing the proportion of carbon dioxide in the atmosphere would raise its temperature.

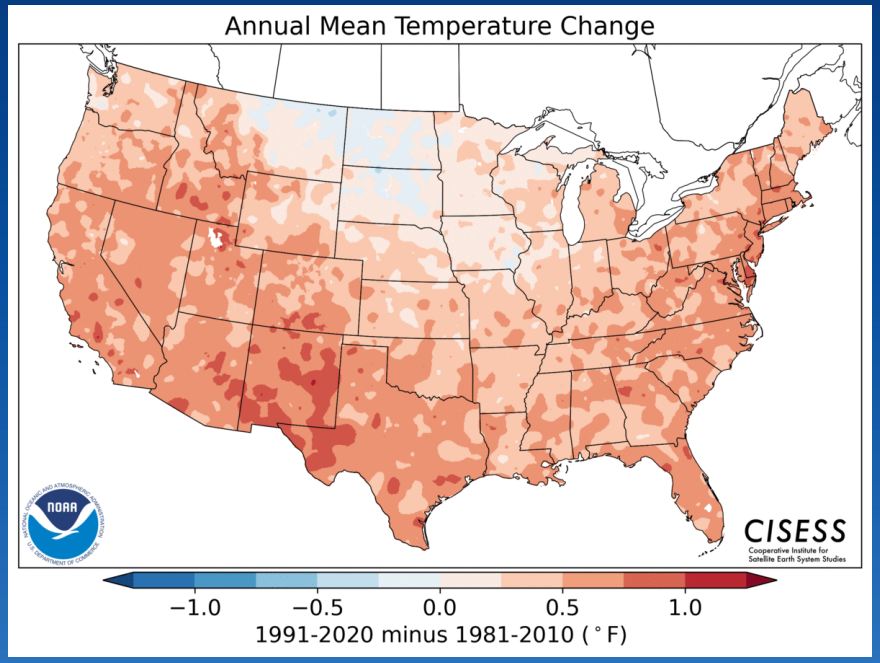
Eunice – 8 minute film on YouTube: https://youtu.be/WxgAOKzOcBU

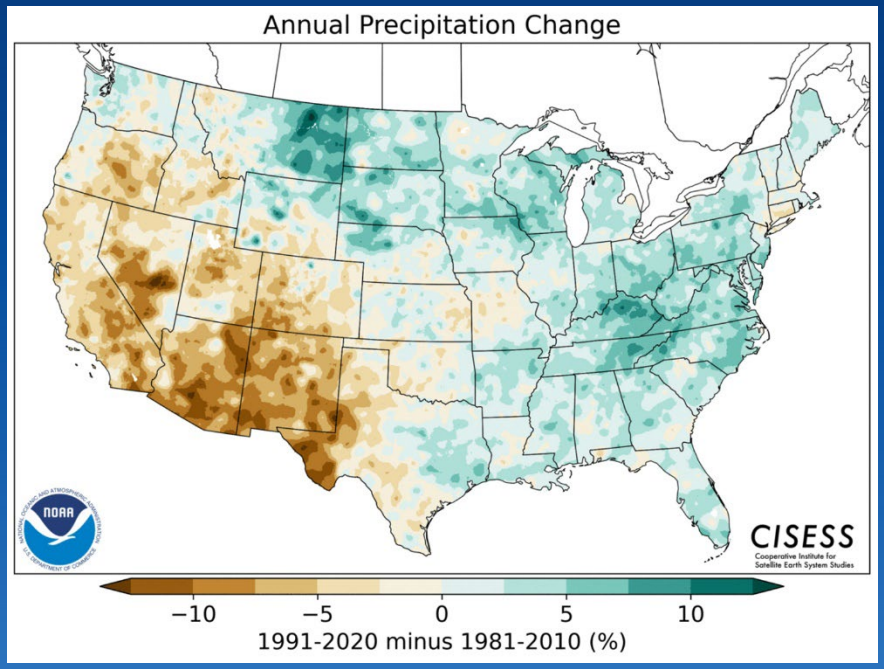
"Hockey Stick" graph of Heat-trapping Gases



New Climate Normals

updated very 30 years

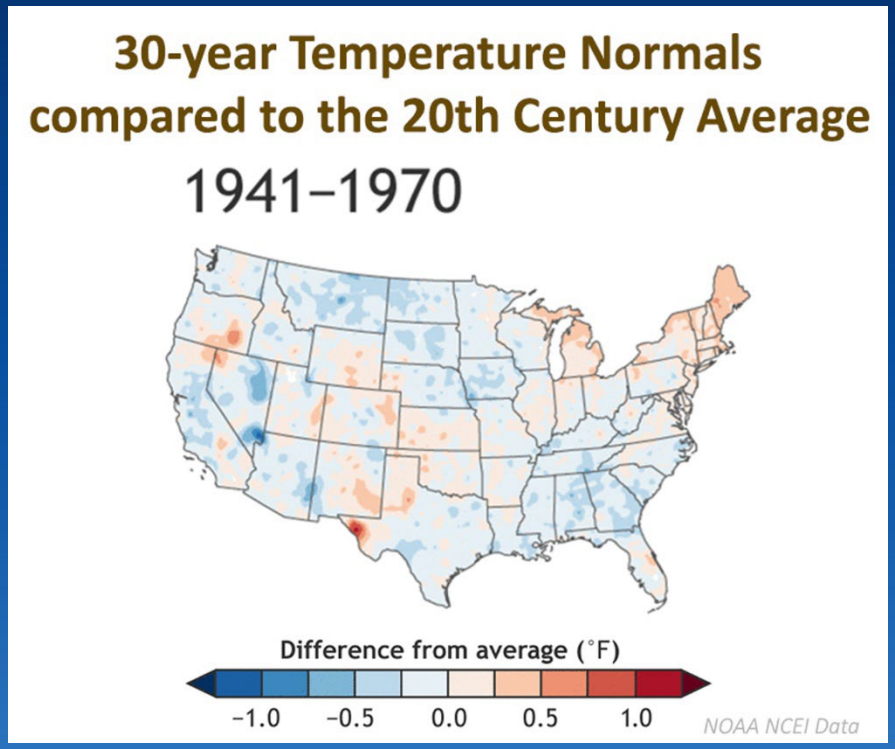


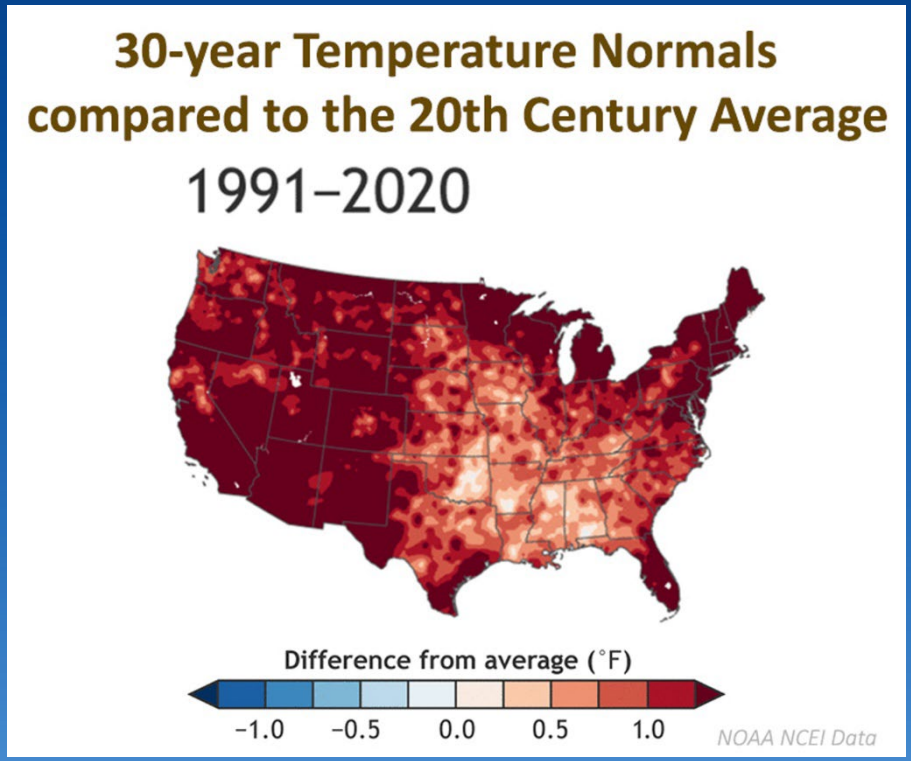


These graphs show differences between successive climate normals

Note – there is a 10-year overlap in datasets

Comparing Normals to 20th Century Average Temperatures





National Climate Assessment (NCA) 2014

TOP 3 FINDINGS

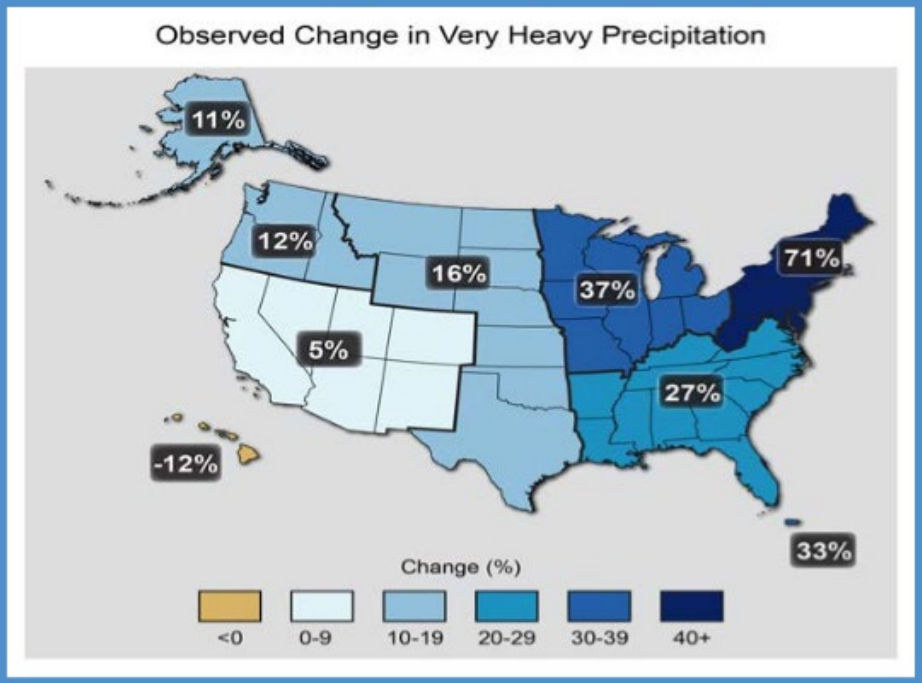


Figure 5. The map shows percent increases in the amount of precipitation falling in very heavy events (defined as the heaviest 1% of all daily events) from 1958 to 2012 for each region of the continental United States. (Figure Source: NCA Ch. 2: Our Changing Climate)

1. Global climate is changing and this is apparent across the United States in a wide range of observations. The global warming of the past 50 years is primarily due to human activities, predominantly the burning of fossil fuels.

2. Some extreme weather and climate events have increased in recent decades, and new and stronger evidence confirms that some of these increases are related to human activities.

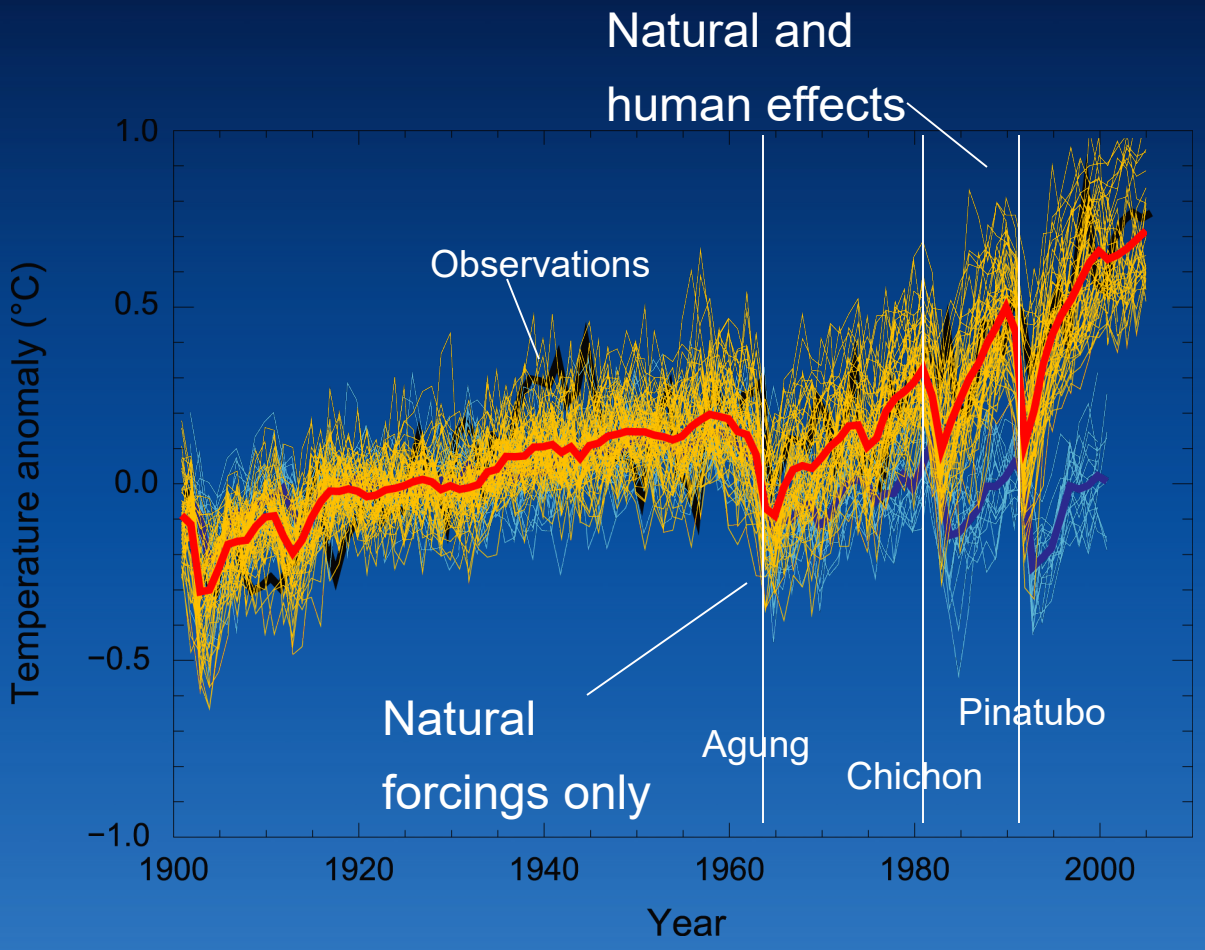
3. Human-induced climate change is projected to continue, and it will accelerate significantly if global emissions of heat-trapping gases continue to increase.

Are Humans Responsible?

IPCC (1995):
"Balance of evidence suggests discernible human influence"

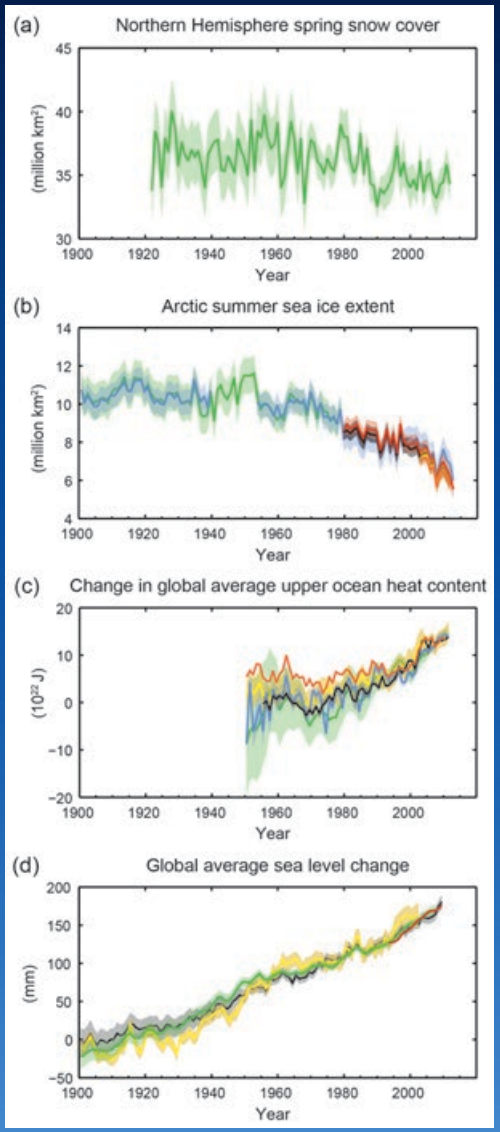
IPCC (2001):
"Most of global warming of past 50 years *likely* (odds 2 out of 3) due to human activities"

IPCC (2007):
"Most of global warming of past 50 years *very likely* (odds 9 out of 10) due to greenhouse gases"



IPCC WG1 (2007)

IPCC 5th Assessment (2013 & 2014)



Snow cover is decreasing

Arctic sea ice is shrinking

Oceans are warming

Sea Level is rising

Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia.

All time series show annual values
(colored lines indicating different data sets)
uncertainties are indicated by colored shading.

https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_SPM_FINAL.pdf

IPCC 6th Assessment (2022 & 2023)

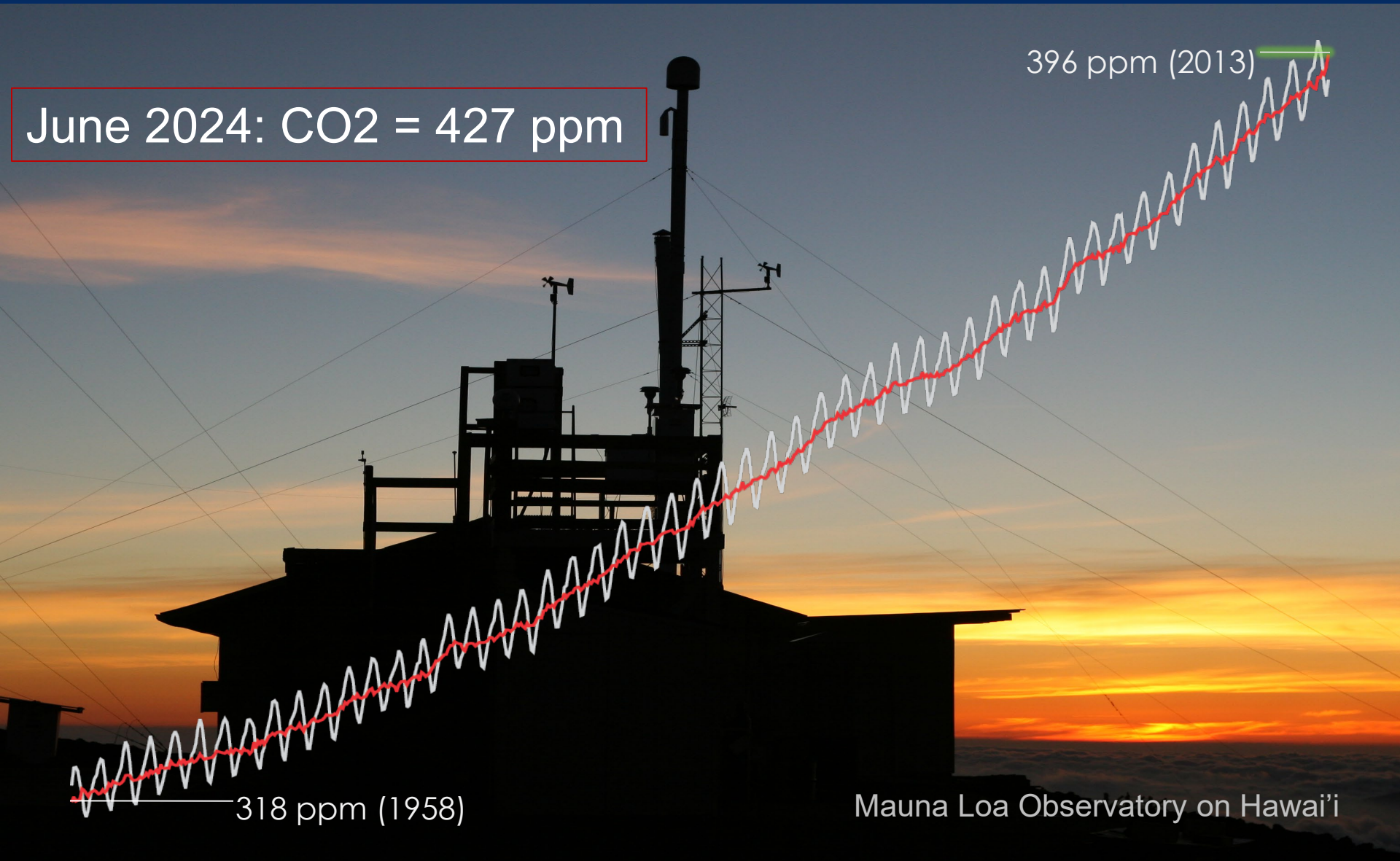
Key Messages

- **1. Fossil fuel emissions from human activities have already raised global temperature by 1.1C (2 degrees F) above 1850-1900**
- **2. Current policy action will lead to further temperature rise, and the impacts on human and other forms of life will become more severe**
- **3. At current emissions levels, we will deplete the remaining carbon budget**
- **4. We need to cut GHG emissions across all sectors urgently, within this decade and no later**
- **5. We have the solutions we need to shift to low-carbon economic systems**

"Several mitigation options, notably solar energy, wind energy, electrification of urban systems, urban green infrastructure, energy efficiency, demand-side management, improved forest- and crop/grassland management, and reduced food waste and loss, are technically viable, are becoming increasingly cost effective and are generally supported by the public"

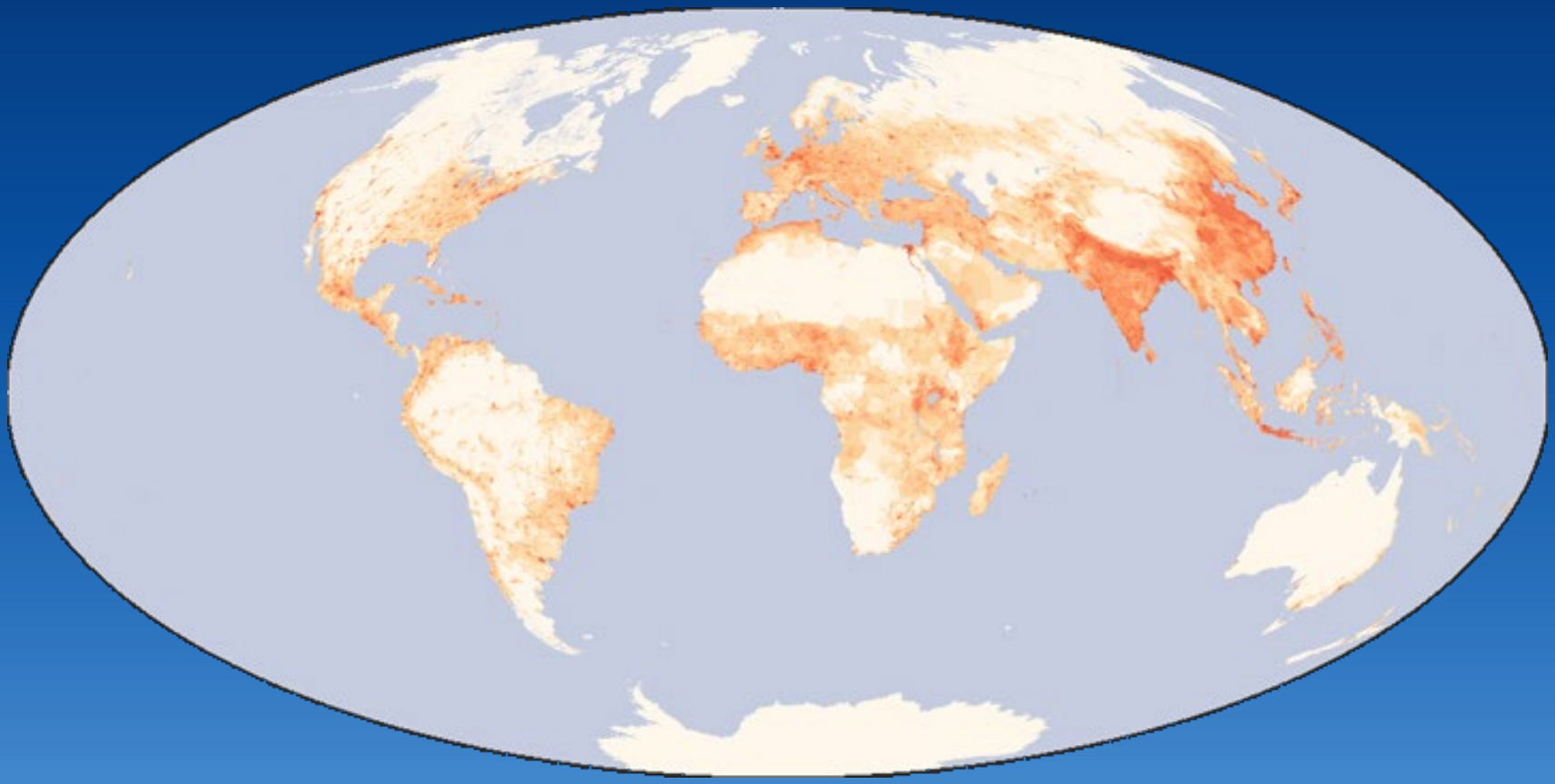
- **6. Political commitment and equity are key to enabling this shift – there is enough finance, it needs to be directed to climate action**

Carbon dioxide has risen by 20% since 1958 and 50% since the Industrial Revolution



What We Know

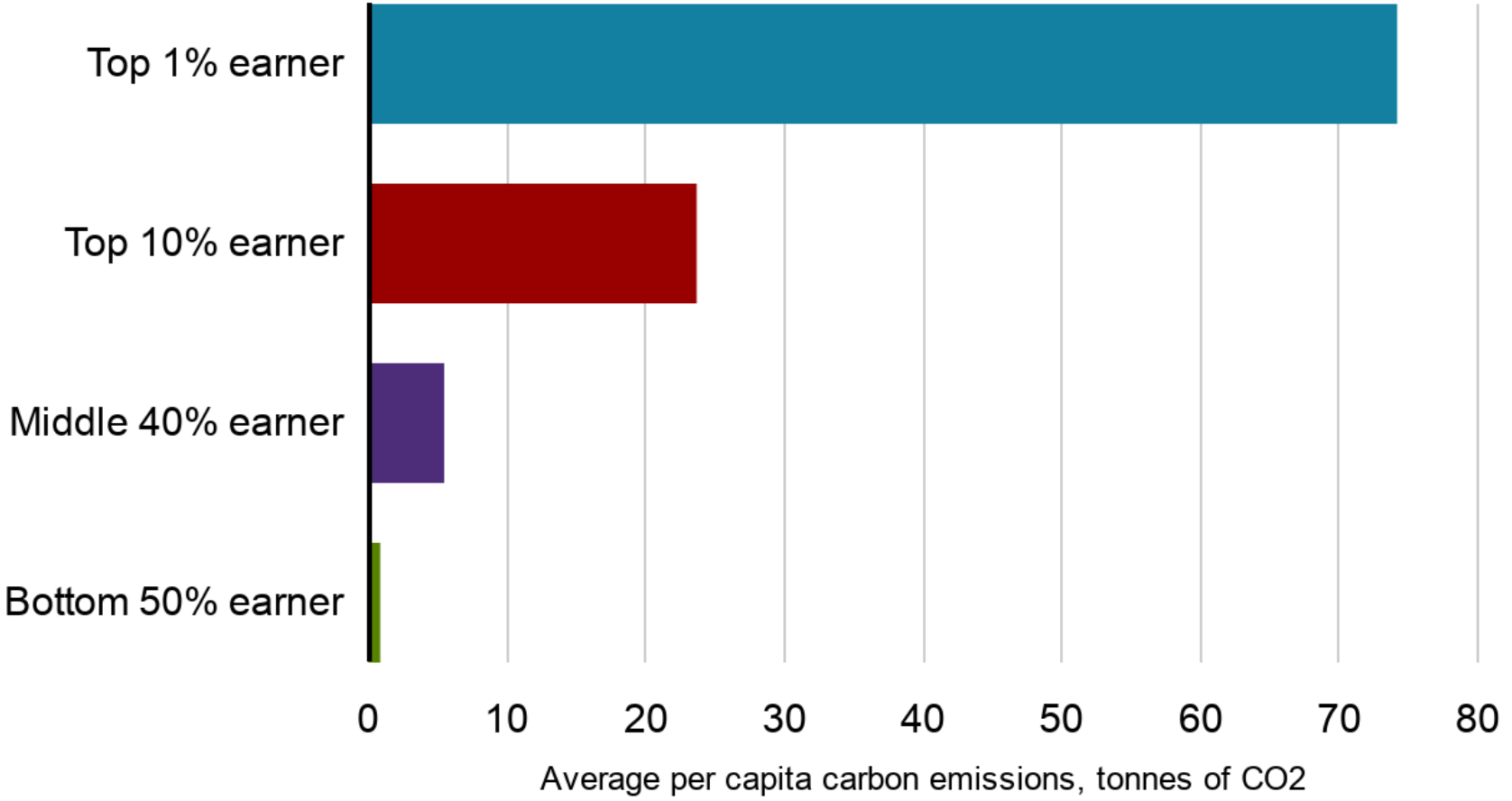
We share this planet with more than 7 billion other humans



7 billion energy-using humans -
some of us use more energy than others…

Who emits the most?

Co2 emissions by four global income groups, 2015

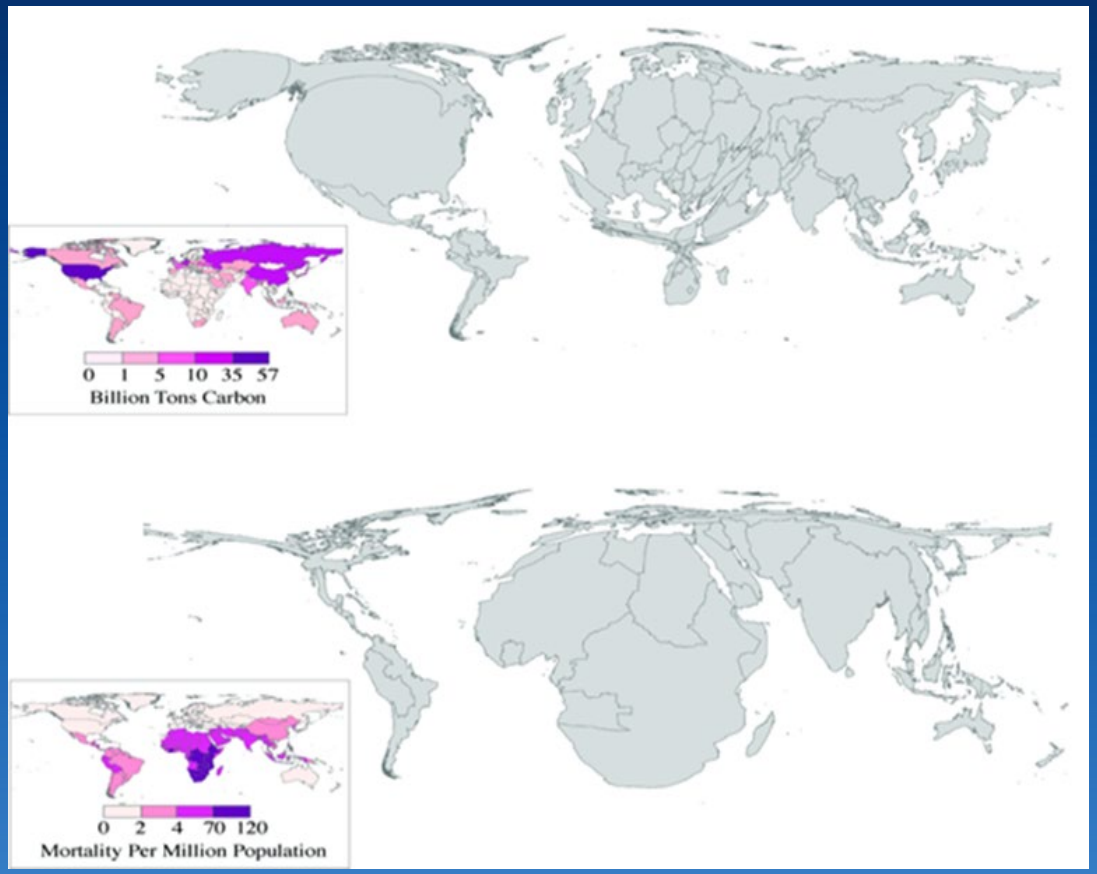


Source: UNEP

BBC

Climate Justice

The World Health Organization claims that climate change is the greatest threat to global health in the 21st century, making climate change a moral problem.

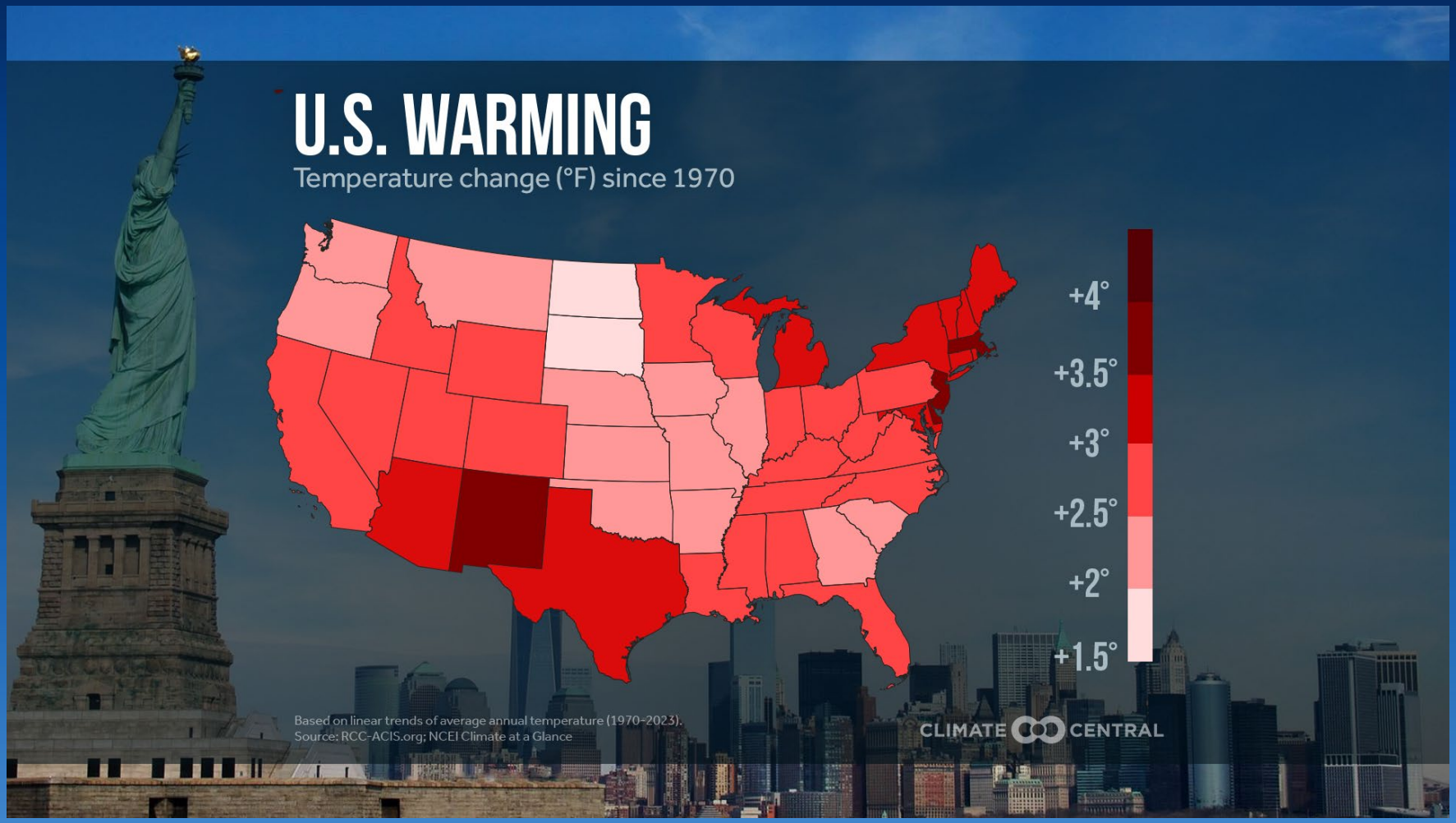


The top map shows the cumulative tons of carbon dioxide emissions from 1950-2000. Note that the United States is bulging.

Meanwhile, the bottom map depicts mortality per million population from climate-sensitive health effects of malaria, malnutrition, diarrhea, and inland flood-related fatalities.

This reveals which countries are the most vulnerable to our changing climate.
It is clear that those most vulnerable are the least responsible

Warming since the 1st Earth Day



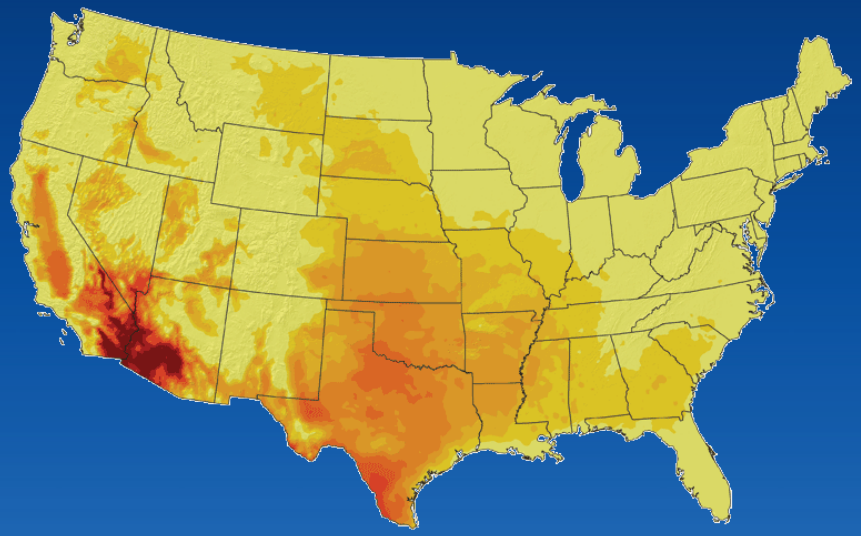
COMMIT SCENARIO

As a result of past emissions, some changes in climate over the next few decades are now unavoidable.

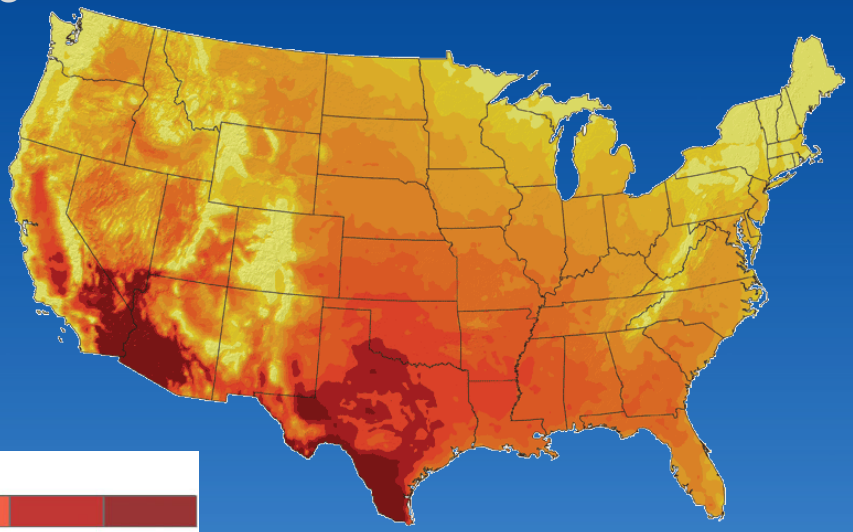
Beyond the next several decades, the amount of climate change we experience will be determined by choices society makes about fossil fuel emissions.

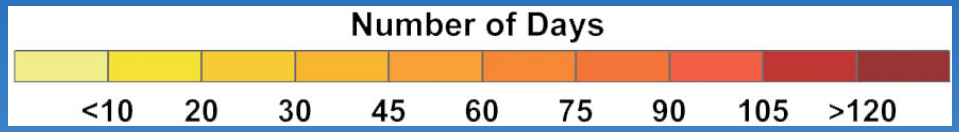
Projections for number of days/year over 100°F

Lower Emissions Scenario, 2080-2099



Higher Emissions Scenario, 2080-2099





What We Might Do About It

Mitigate

Get off fossil fuels or figure out how to remove carbon dioxide from the atmosphere

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Spend money to get ready for things to be different than they have been

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Get off fossil fuels or figure out how to remove carbon dioxide from the atmosphere

Adapt

Spend money to get ready for things to be different than they have been

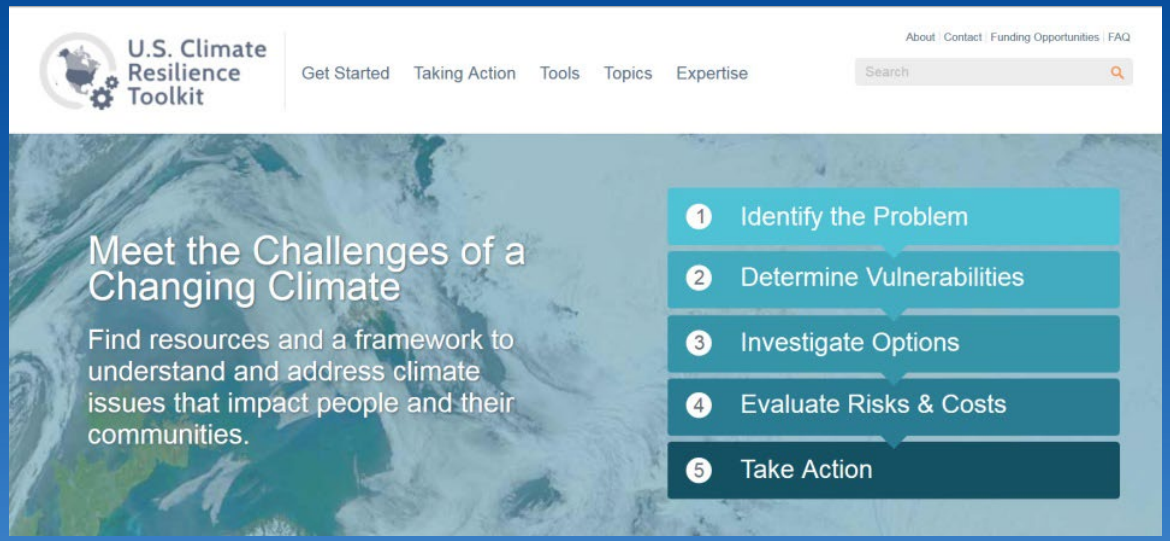
Suffer

Deal with changes, including increased numbers and severity of extreme events

Adaptation

Adaptation planning takes place on national and regional levels **but *actions take place locally.***

More examples from around the U.S. are available via the U.S. Climate Resilience toolkit



https://toolkit.climate.gov/

Mitigation – actions to slow future warming

- Mitigation starts with every individual

According to the IPCC:

- "Efficiency enhancements and behavioral changes, in order to reduce energy demand compared to base-line scenarios without compromising development, are a key mitigation strategy. "
- "Behavior, lifestyle and culture have a considerable influence on energy use and associated emissions, with high mitigation potential in some sectors, in particular when complementing technological and structural change." (mobility demand and mode, energy use in households, choice of longer-lasting products and dietary change and reduction in food wastes)

- Mitigation requires regional, national & global policies

Examples:

- Clean Power Plan - cut carbon pollution from the U.S. power sector by 32% by 2030 (dead right now)
- Paris Accord - Hold global average temperature to below 2 degrees C above pre-industrial levels
- California's 2015 Under 2 MOU
- RGGI - Regional Greenhouse Gas Initiative in the northeast U.S. – cap and trade
- The Western Climate Initiative (WCI) – multi state tracking process
- Citizens Climate Lobby – carbon tax where monies collected go back to citizens
- Green New Deal – Aggressive Targets, no actuall specifics

IPCC 6th Report (2022 & 2023)

The Intergovernmental Panel on Climate Change (IPCC) urges countries and individuals enact the following to avoid the worst of Climate Crisis …

- Stop methane emissions
- Stop deforestation
- Restore degraded land
- Change what we eat
- Adapt Renewable Energy
- Use energy more efficiently
- Stop burning Fossil Fuels
- **ACT NOW**

Climate change – summary points

1. It's real
2. It's us (human caused)
3. Experts agree
4. It's bad (harmful to humans)
5. We have solutions that are:
   - Technically feasible.
   - Economically affordable.
   - Politically viable.