The Growing Risk from Extreme Heat Under Global Climate Change

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White House Webinar on

Building Community Preparedness for Extreme Heat

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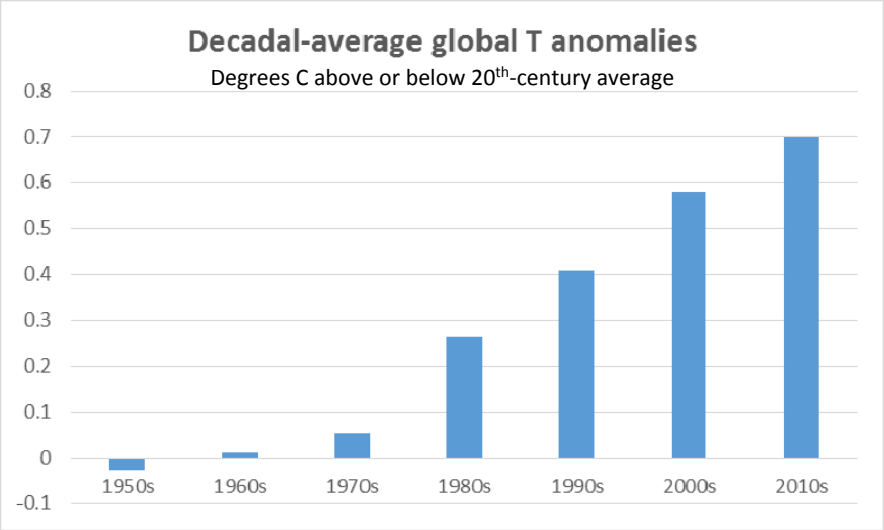
The overarching science context

Climate science has established that…

- Earth's climate is changing at a pace and in a pattern not explainable by natural influences.
- The dominant cause of the changes is an increase in the atmospheric concentrations of carbon dioxide (CO_2) and other heat-trapping gases caused primarily by fossil-fuel burning and land-use change.
- These changes are already causing harm to life, health, property, economies, and ecosystems, with more heat waves, downpours, droughts, and wildfires; more of the most powerful storms; worse smog; and major impacts on ecosystem dynamics.
- The harm will continue to grow for decades, because of the momentum in the climate system and the inertia in society's energy system.
- But the projected harm will be much smaller if we take prompt, strong evasive action—both mitigation and adaptation—than if we don't.

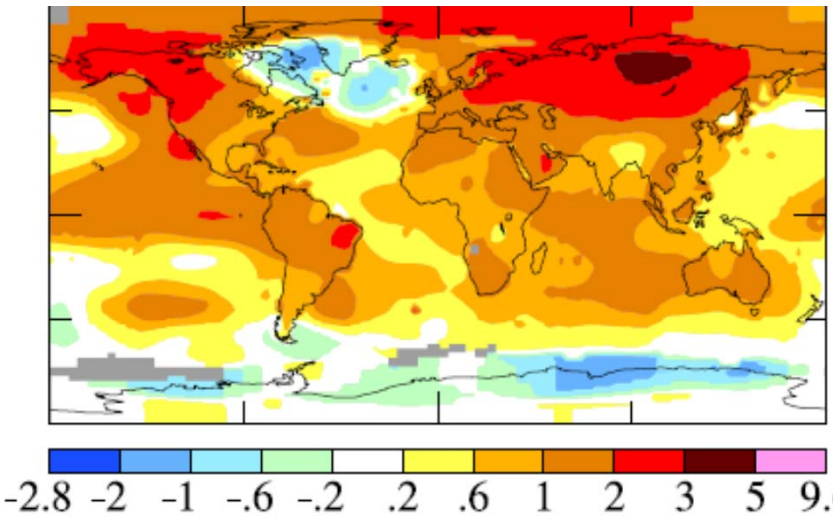
Each decade has been warmer than the last since the 50s



Calculated from NOAA data at https://www.ncdc.noaa.gov/sotc/global/201513#gtemp

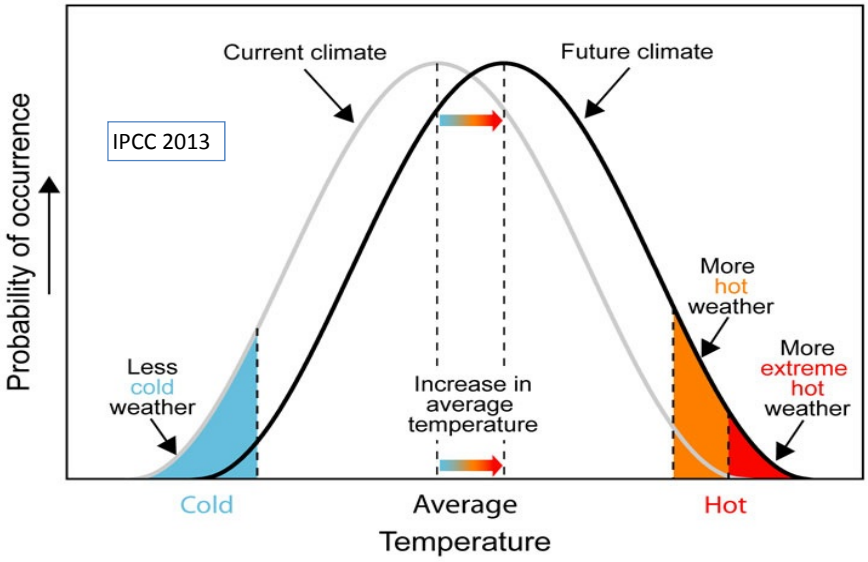
The warming is not uniformly distributed

12-month mean for 2015 in °C **Global avg = 0.87°C**



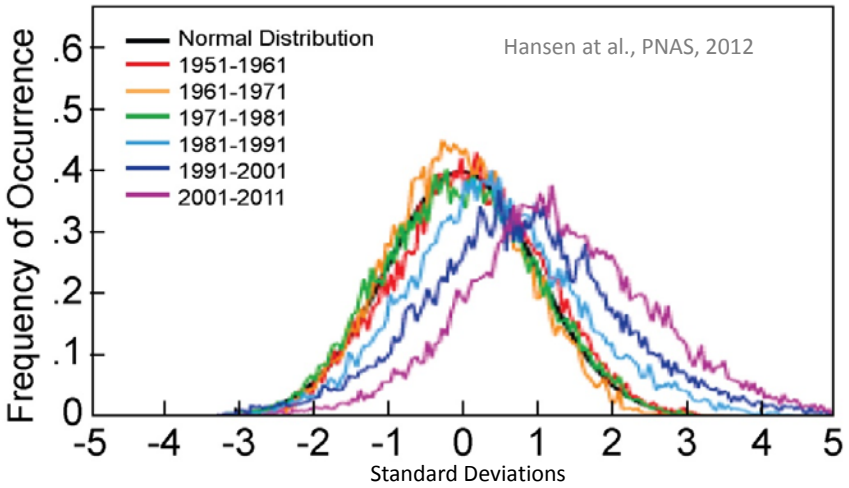
NASA Goddard Institute for Space Studies 2016

Why a small increase in average T leads to a big increase in hot weather



Observations show big increase in hot extremes

Probability distribution for Jun-Jul-Aug temperature anomaly on land in the Northern Hemisphere. Baseline normal distribution is for 1951-80.



Portion of Northern Hemisphere land experiencing ≥ 3σ summer heat in a given year increased from 0.1-0.2% in 1951-80 to 10% in 2001-2011—a 50- to 100-fold increase. A 3σ summer is one that would occur only once in 670 years under the baseline climate.

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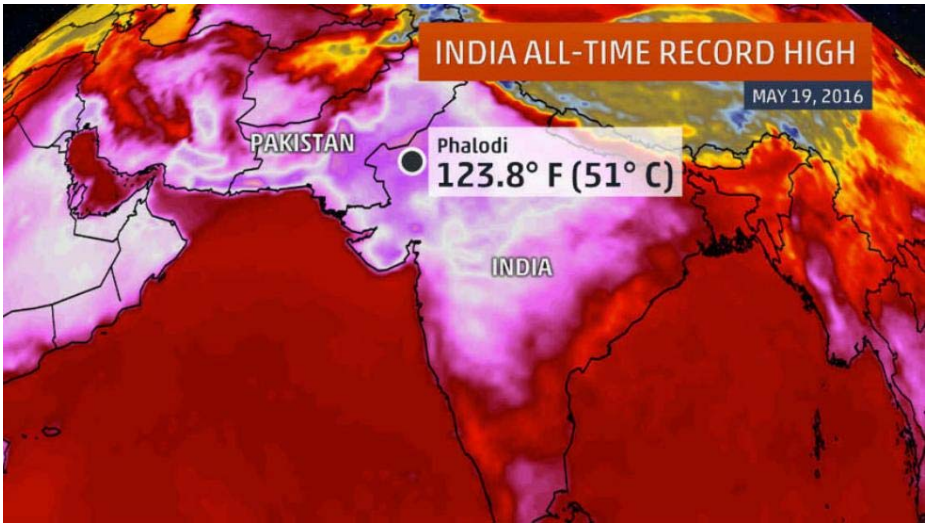
South Asia this month provides a sobering example



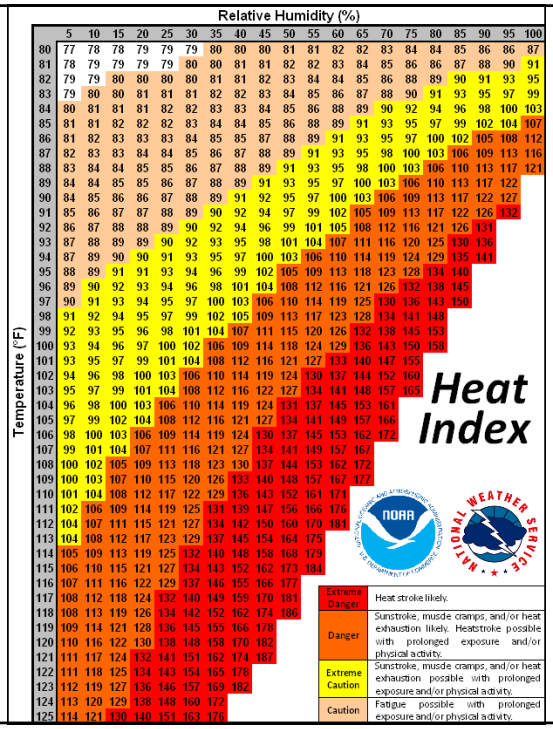
Source: The Weather Channel, 5-20-2016

It's not just about temperature: Humidity combines with T to create discomfort & danger.

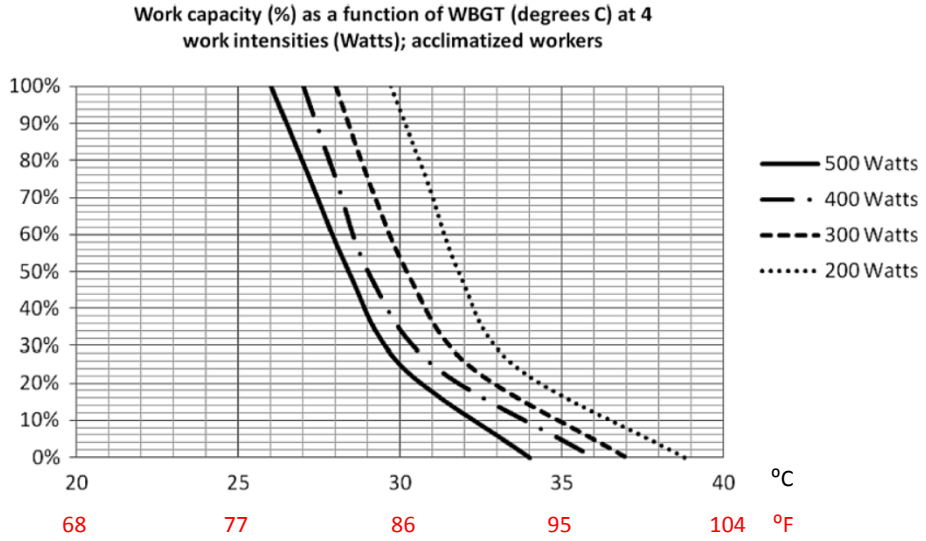
The highest heat-index values ever recorded were 173°F in Saudi Arabia in 2003 & 163°F in Iran in 2015.
(Washington Post, 07-31-15)

Nine of the ten deadliest heat waves on record have occurred since 1980, six of them since 2000. (International Disaster Database)

Extreme heat poses particularly high risks for children, the elderly, & the disadvantaged.

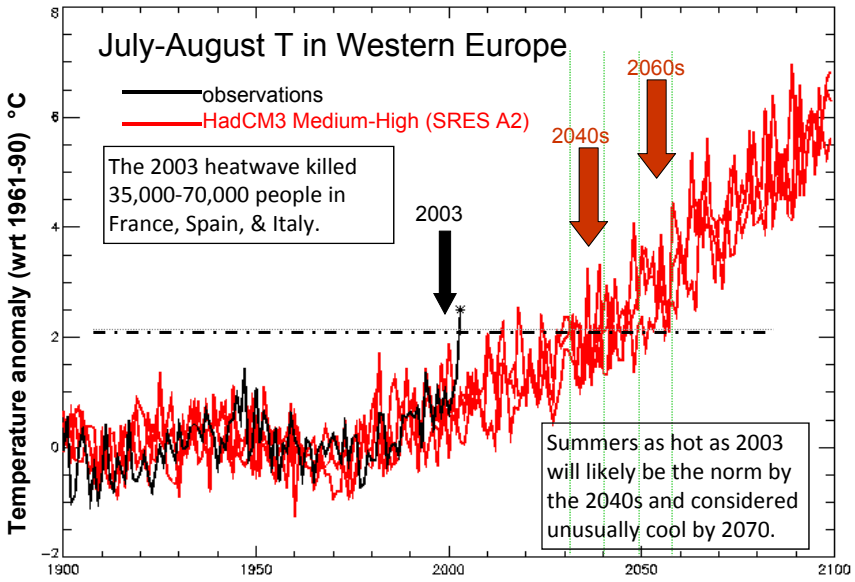


Working outdoors becomes inefficient and then impossible as heat & humidity increase



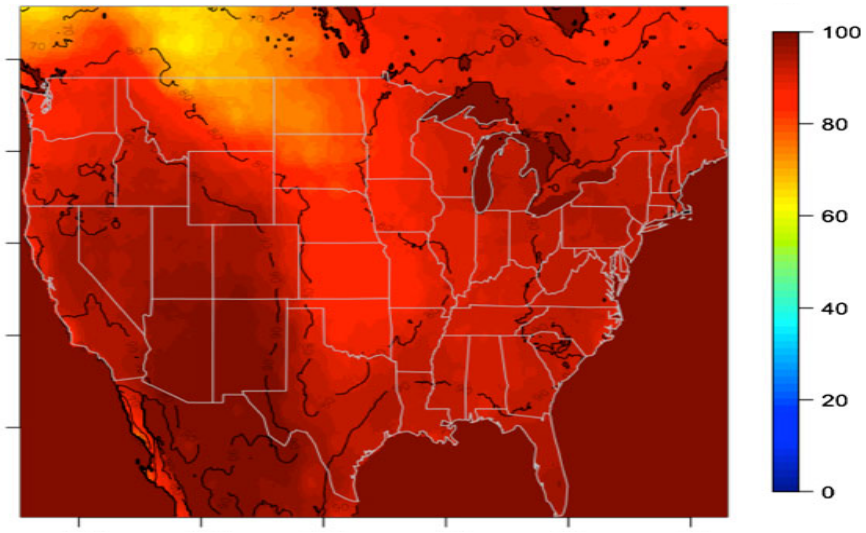
Kjellstrom et al., Archives of Environmental & Occupational Health, May 2015

What's expected going forward: Europe



Redrawn from Stott et al., NATURE 432, pp 610-614, 2 December 2004

What's expected going forward: United States



Percentage of summers during 2035-2064 when mean temperature exceeds the 95th percentile value during 1950-1979. Duffy & Tebaldi Climatic Change 2012.

The policy questions

What should we do?

There are only three options:

- Mitigation, meaning measures to reduce the pace & magnitude of the changes in global climate being caused by human activities.
- Adaptation, meaning measures to reduce, through building preparedness & resilience, the adverse impacts on human well-being resulting from the changes in climate that do occur.
- Suffering the adverse impacts and societal disruption that are not avoided by either mitigation or adaptation.

Concerning the three options…

- We're already doing some of each.
- What's up for grabs is the future mix.
- Minimizing the amount of suffering in that mix can only be achieved by doing a lot of mitigation and a lot of adaptation.
  - Mitigation alone won't work because climate change is already occurring & can't be stopped quickly.
  - Adaptation alone won't work because adaptation gets costlier & less effective as climate change grows.
  - We need enough mitigation to avoid the unmanage-able, enough adaptation to manage the unavoidable.

What does adaptation for extreme heat look like?

That's the focus of the rest of this White House webinar.