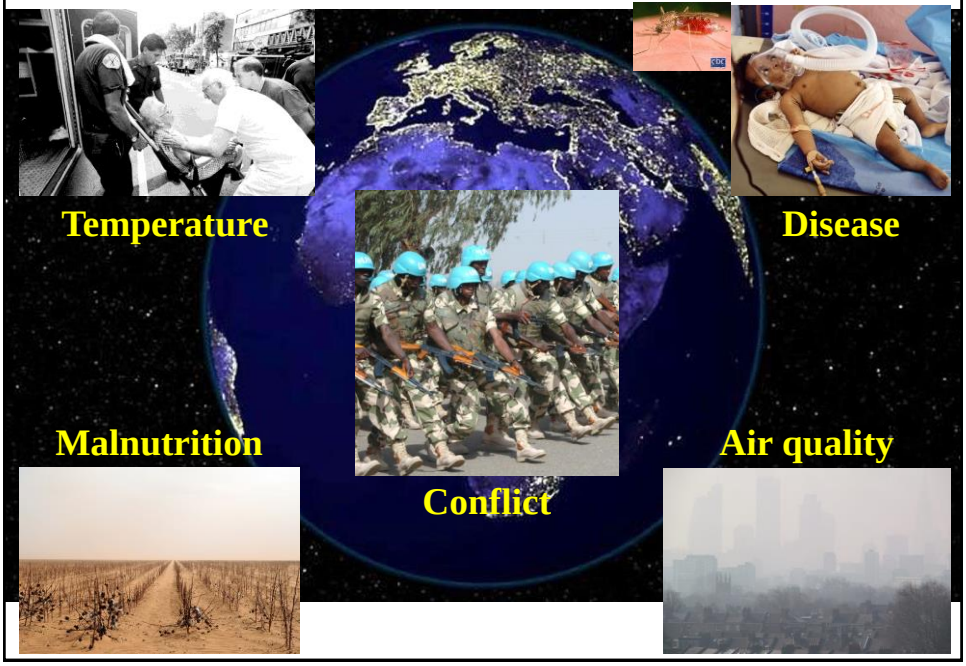
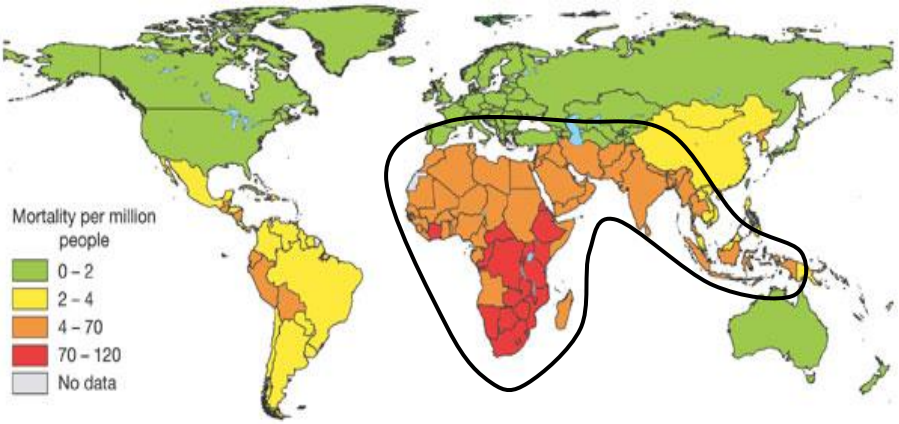
How Will Climate Change Affect Human Health?



World Health Organization estimates that climate change <u>already</u> kills 150,000-300,000 people per year



- death rates are greatest in Africa

With 4º warming, by 2100 Detroit is predicted to have 23 days per year over 100º C

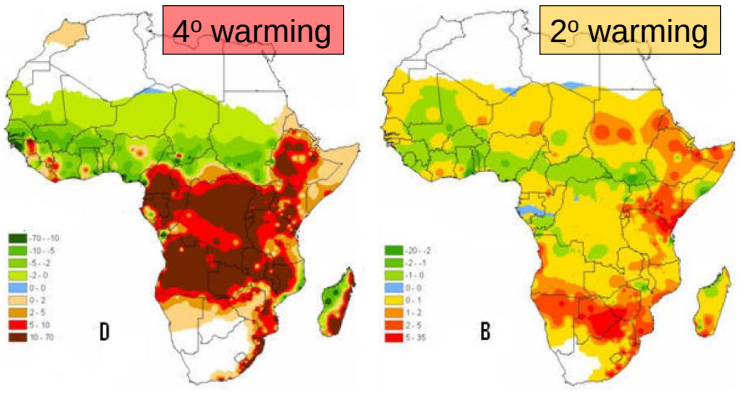
With 4º warming, heat waves will increase dramatically - but much less so with 2º warming

Number of Chicago 1995-like heat waves *per decade*

City	1961-1990	2070-2099	
		2º	4º
CHICAGO	0.11	4.22	27.44
CINCINNATI	0.11	1.44	21.44
CLEVELAND	0.00	0.33	11.11
DES MOINES	0.56	4.33	34.44
DETROIT	0.11	1.44	19.33
INDIANAPOLIS	0.22	2.11	24.56
MILWAUKEE	0.00	0.78	12.67
MINNEAPOLIS	0.11	1.89	19.67
ST LOUIS	1.33	11.11	59.89

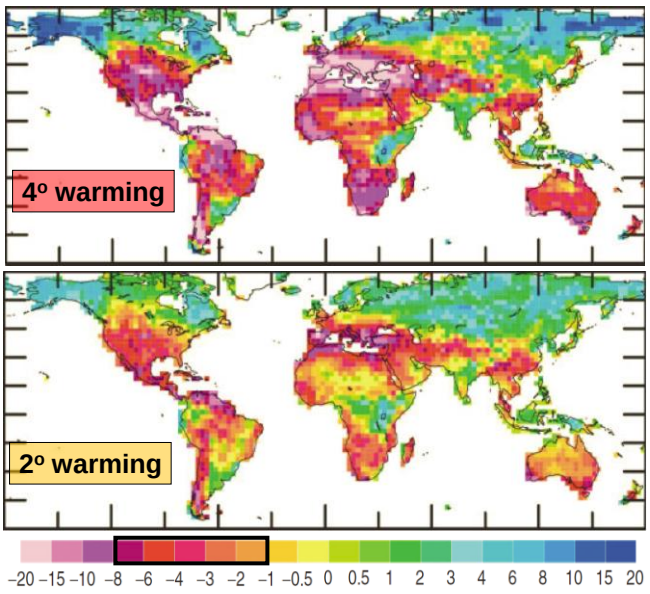
- could prevent 1,600 deaths per year in Chicago and 1,300 " " " in Detroit

Limiting warming to 2° C would prevent 200 million people from exposure to malaria



- would prevent 2 million deaths

Droughts would be much less frequent and severe



The Paris Agreement would substantially reduce crop losses, particularly at low latitudes


Corn (maize)


Wheat


Rice

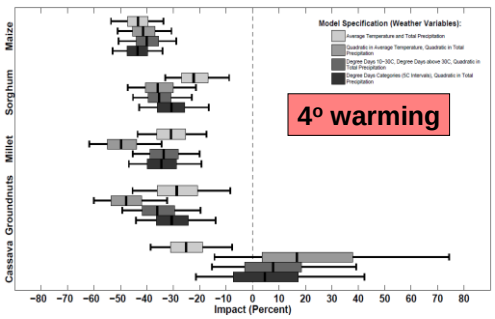

Soybean

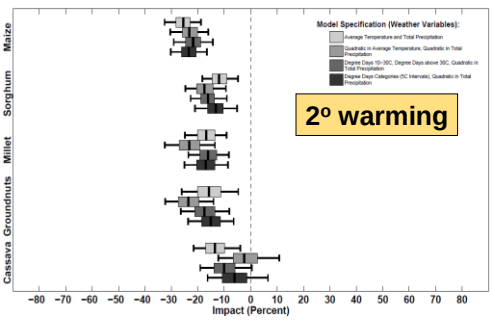
Average Yield Change 4° → 2°

Mid/High latitudes: +3%

Low latitudes: +10%

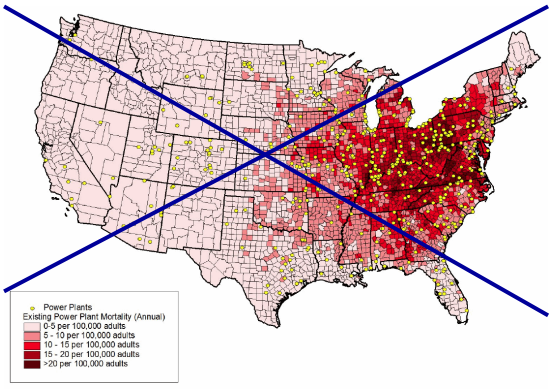
Especially throughout sub-Saharan Africa



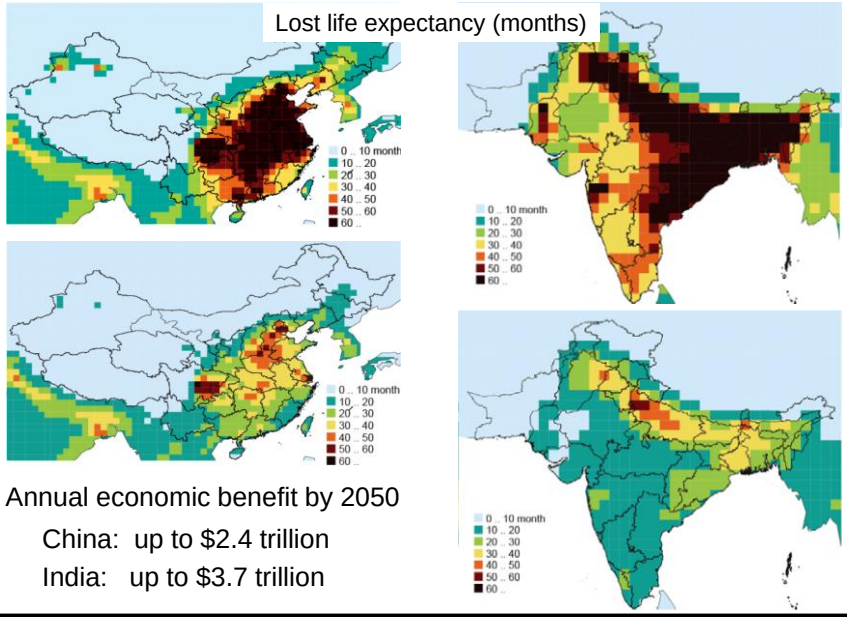


As a result, 260 million fewer people would be at risk of hunger

Eliminating coal power would prevent 20,000 heart attacks and 13,000 deaths per year in the U.S.



Reducing coal power would also save many more lives in China and India



Annual economic benefit by 2050

China: up to $2.4 trillion

India: up to $3.7 trillion

With our current 4º warming trajectory, by 2030 the probability of civil war in sub-Saharan Africa increases by 55%

- with 2º warming, the probability increases by 45%

Most worrisome scenario: an India/Pakistan water war

- Indus supplies >80% of Pakistan's irrigation water

The Paris Agreement would dramatically reduce human displacement due to coastal flooding

- globally, 40 million fewer "climate refugees" per year

Climate change is a major U.S. national security threat

"The effects of climate change in the world's most vulnerable regions present a serious threat to American national security interests. Washington must lead on this issue now."

Partnership for a Secure America, February 2013

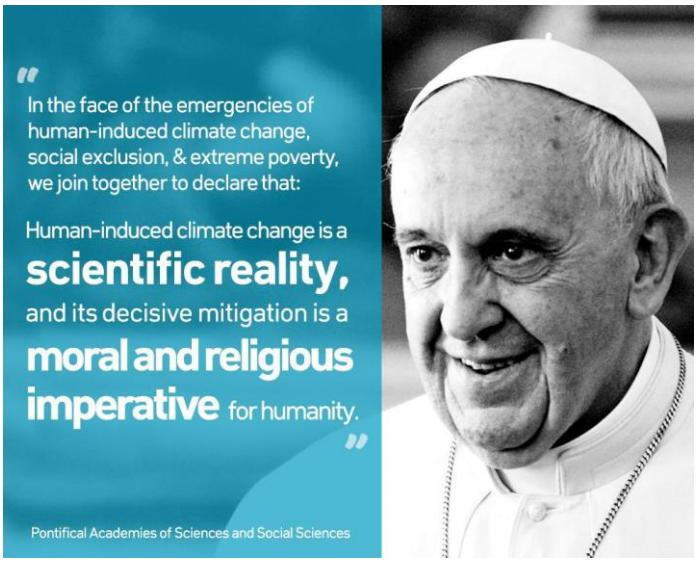
Typical Recommendations:

1. The national security consequences of climate change should be fully integrated into national security and national defense strategies.
2. The U.S. should commit to a stronger national and international role to help stabilize climate changes at levels that will avoid significant disruption to global security and stability.
3. The U.S. should commit to global partnerships that help less developed nations build the capacity and resiliency to better manage climate impacts.

People in developed countries are causing the problem, but people in developing countries will suffer most of the health effects

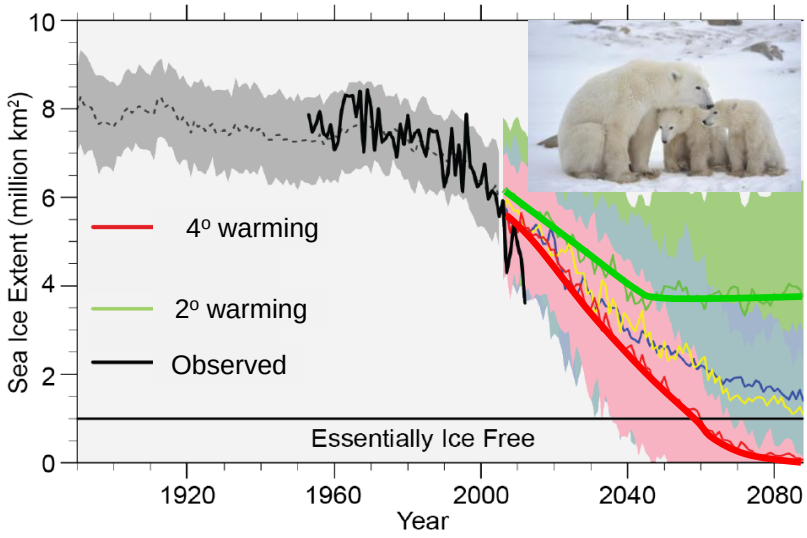
Countries proportional to CO_2 emissions through 2002:

Countries proportional to climate-related health effects:



How would limiting warming to 2º affect Earth's nonhuman species?

- would probably prevent extinction of polar bears

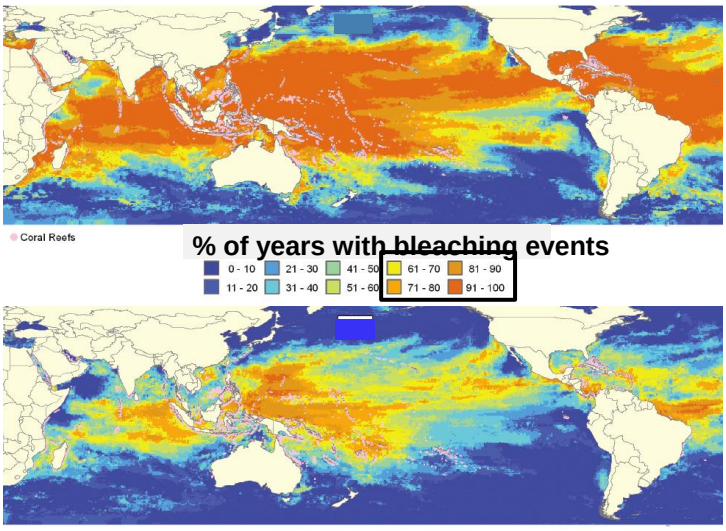


And would prevent extinction of ~15% of large African mammals





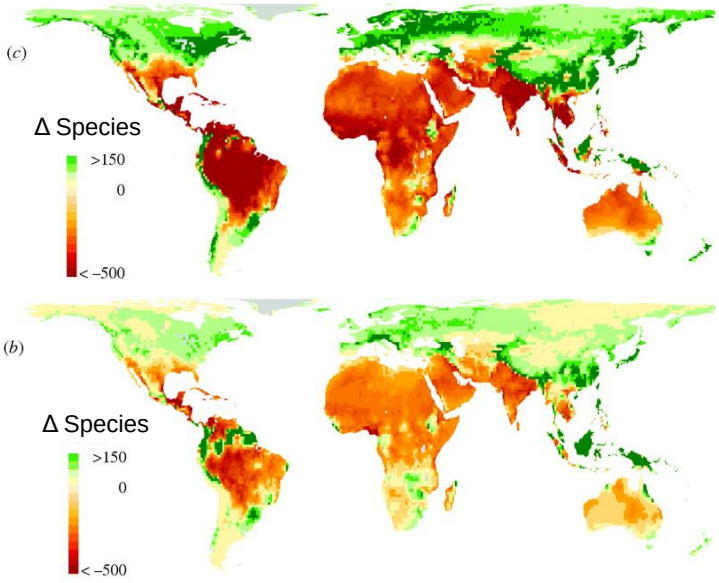

Limiting warming to 2º would prevent thousands of coral reef bleaching events



4º warming

2º warming

The Paris Agreement would prevent loss of tens of thousands of plant species



4º warming

2º warming

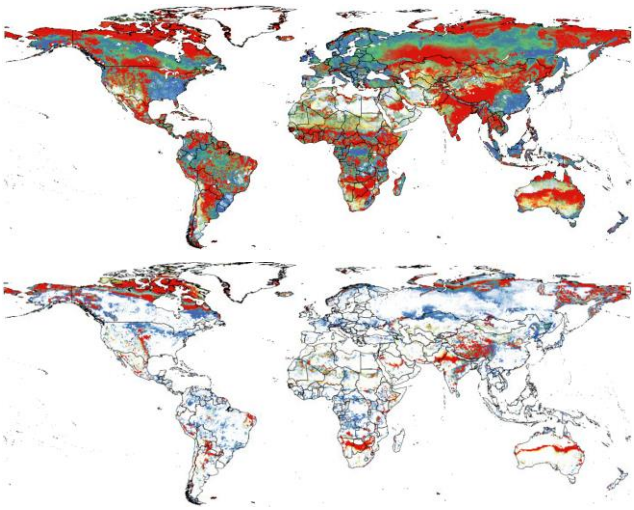
With 4º warming, much of the planet would be at risk of at least moderate biome change

Moderate change
e.g. temperate mixed forest to temperate evergreen forest


Major change
e.g. tropical forest to savanna


Limiting warming to 2º would reduce the area at risk of at least moderate biome change from 70% to 25%

Major change | Major/Moderate change | Moderate change

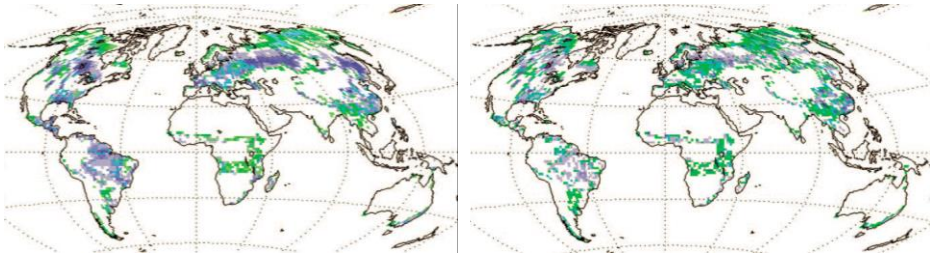


4º warming

2º warming

Catastrophic loss of the Amazon rainforest and boreal forests would be prevented

Blue: Forest loss



4º warming

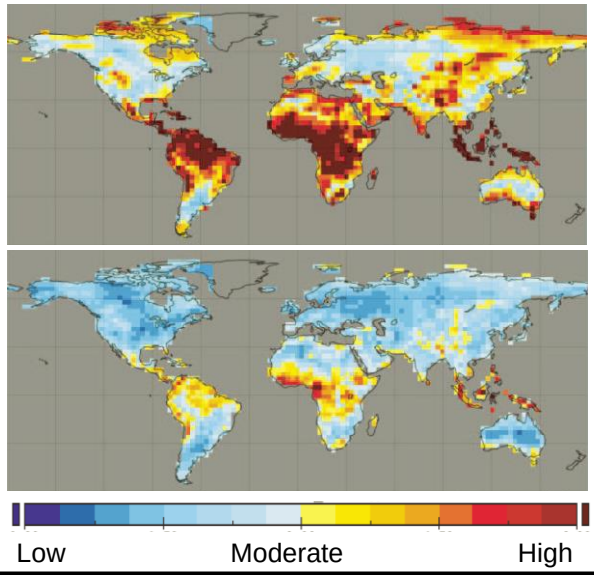
2º warming

Probability of losing ≥ 20% of boreal forest: 35% → 0%

Probability of losing ≥ 20% of Amazon rainforest: 15% → 0%

Limiting warming to 2º C would dramatically decrease the probability of species extinctions globally

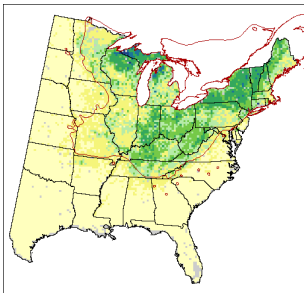
Probability of species extinctions

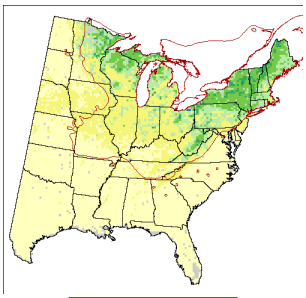


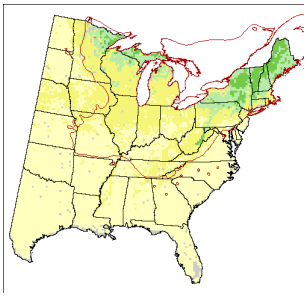
3.5º warming

2º warming

For Michigan, 2º warming would reduce loss of sugar maple by 25%







Current | **2º warming** | **4º warming**

https://www.fs.fed.us/nrs/atlas/tree/resources/spp-list.php

Loss of many other Michigan trees would also be reduced by 25-50%

Black cherry

White pine

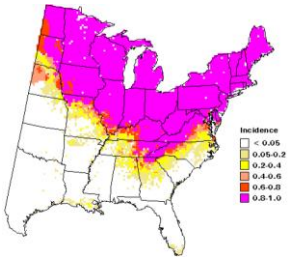
Northern red oak

Eastern hemlock

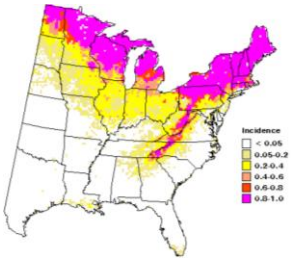
Big tooth aspen

American beech

For Michigan, 2º warming would reduce loss of song sparrows from 60% to 15%

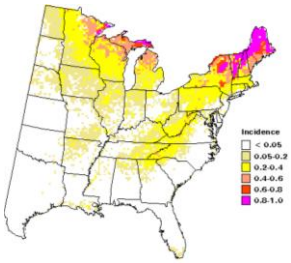



Present



2º warming

-15%



4º warming

-60%

Loss of many other Michigan birds would also be reduced by 20-50%

House Wren

Yellow Warbler

Bobolink

Cedar Waxwing

Goldfinch

Veery

Bottom line: Michigan and the rest of the planet would benefit tremendously from limiting warming to 2 °C. It's still an achievable target, and it's worth fighting for.