The Impacts of Climate Change

What do impacts tell us about near term climate policy?

Global Warming: Looking Beyond Kyoto

Reason for Concern

- Global Warming will affect every human on the planet
- It is a long term problem- likely lasting for centuries
- Large momentum to systems involved- not easily steered
- Uncertainty about long term effects is large

What are the key vulnerabilities?

- Pearce et al 1996 identified:
- Market sectors: agriculture, coastal development, energy, forestry, water
- Nonmarket sectors: ecosystems, human health (pollution, infectious diseases, heat stress)
- Extreme events (extreme weather, polar melting, thermohaline failing)

Methods of Valuation

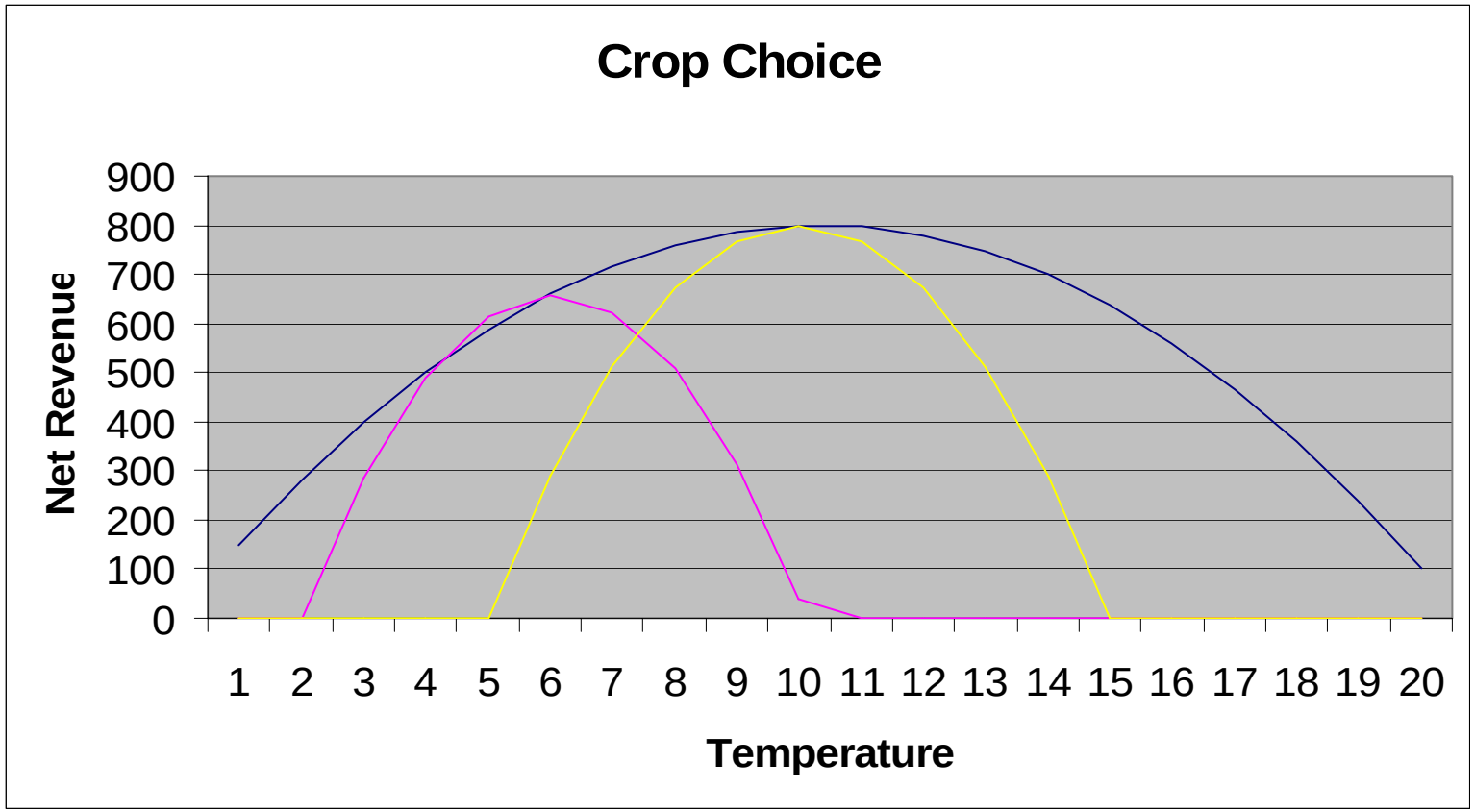
- Experimental-Simulations
  - Begin with controlled experiments
  - Interpolate to larger universe with model
  - Adaptation included by researcher
- Cross Sectional Research
  - Examine subjects living in different climates
  - Adaptation automatically included
  - Must control for other variables across space

Quantification

- Fankhauser 1995 estimated 2XCO2 would lead to future damages of $270 billion or 1.4% of GDP
- Tol 1995 estimated 2XCO2 would lead to damages of $315 billion or 1.9% of GDP
- These estimates suggest a current damage per ton of CO2 of about $5
- Adding unmeasured effects could get the estimates to $20/ton

More Recent Research has updated these estimates

- New research includes adaptation
  - Victims react and change behavior to reduce damages
- Damage functions are now understood to be hill-shaped
  - Benefits as well as damages to climate change, especially at first
- Impacts should be estimated in a future economy (larger impacts, smaller % GDP)


Crop Choice
Net Revenue
900
800
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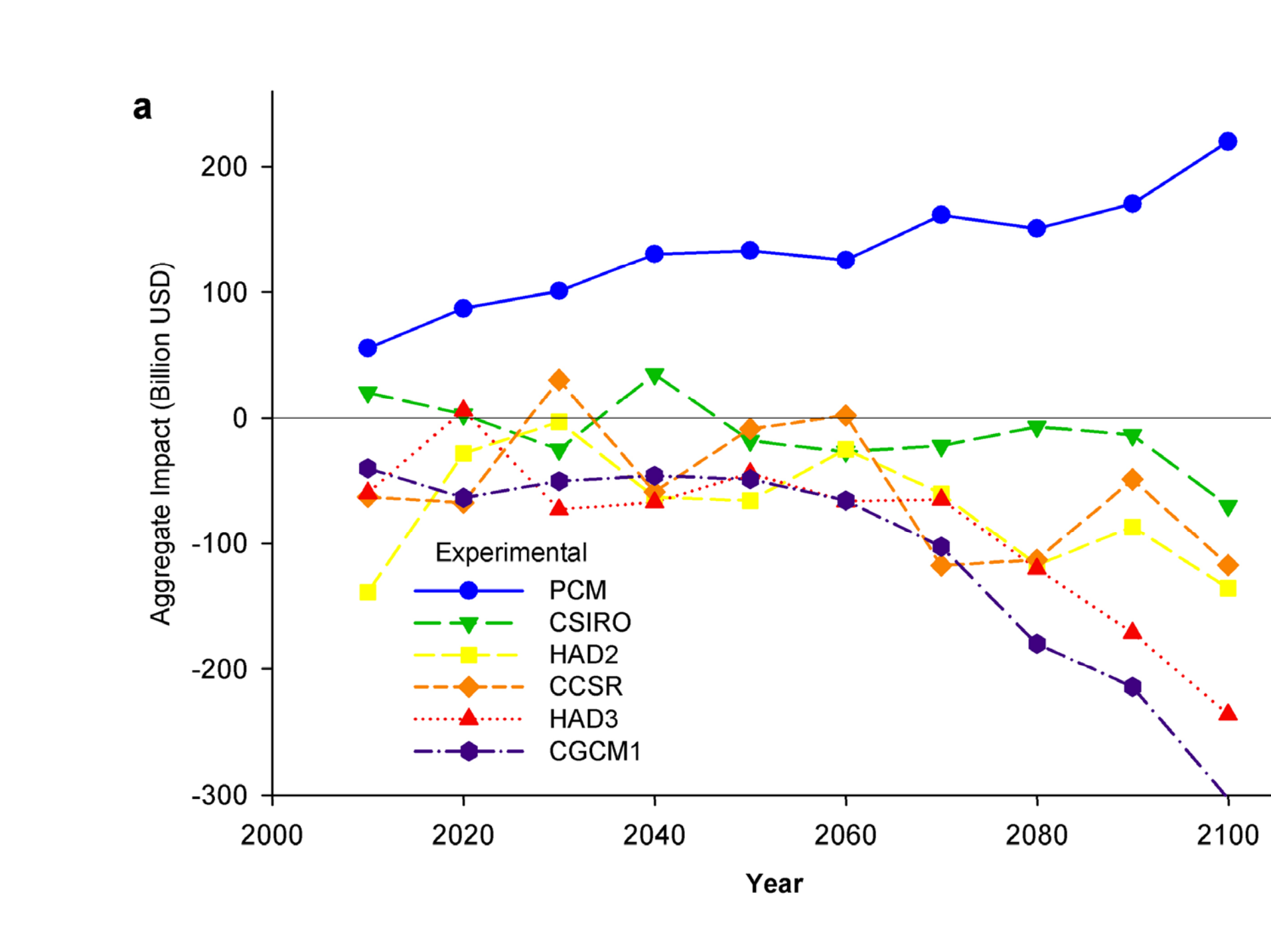
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Temperature

New Damage Estimates

- Mendelsohn et al 2005 for 2100 damages between 0 to -$500 billion which is between +0.0% of GDP to 0.24% of GDP
- Numbers are approximately an order of magnitude smaller than 1996 estimates
- Current damages/ton CO2 are between

  -$2 and +$2/ton


a
200
100
0
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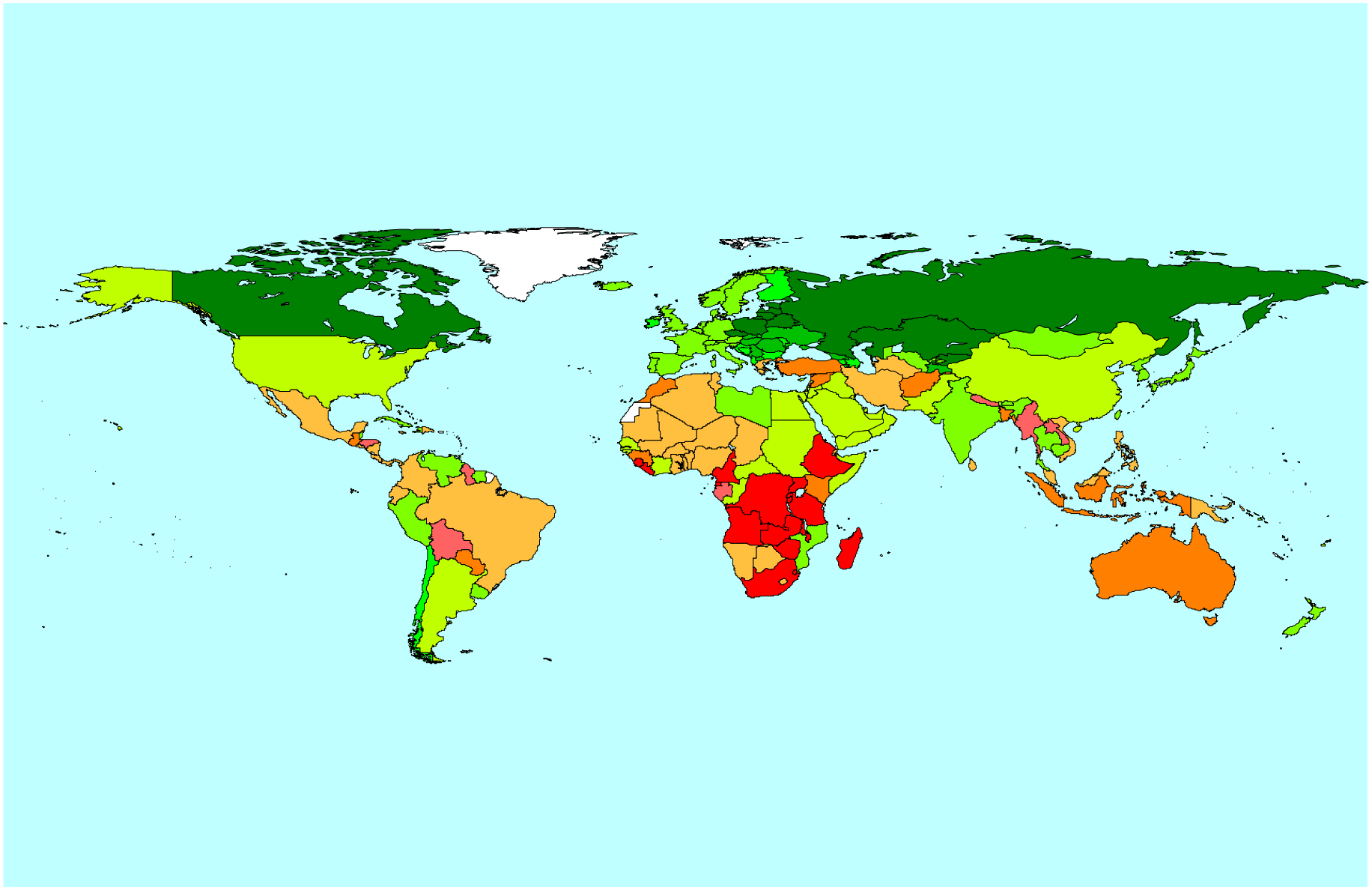
Aggregate Impact (Billion USD)
2000
2020
2040
2060
2080
2100
Year
Experimental
PCM
CSIRO
HAD2
CCSR
HAD3
CGCM1

Dynamic Outcomes

- Annual damages and benefits comparable for the next fifty years
- Beyond 2050, damages start to exceed benefits
- Problem gets worse as greenhouse gases accumulate
- Future damages/ton will be higher



Equity Impacts

- The brunt of climate damages will be felt by low latitude developing countries
- Mid-latitude developed countries will face small net impacts from climate change through the century
- High latitude countries will likely benefit from warming

Policy Implications

- Optimal near term response is modest- current damages not sufficiently large
- Abatement policies should be dynamic reflecting the growing damages of a ton over time
- Abatement plans should be flexible as more is learned about impacts and mitigation
- All countries will need to learn how to adapt to climate change
- Compensation is needed for low latitude developing countries for their inordinate burden of damages