

Historical Perspectives on Climate Change

EES 3310/5310

Global Climate Change

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Connecting the Pieces

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1. Targets for emissions & temperature
2. Connecting new policies to previous international agreements & treaties
3. International coordination & enforcement
4. National policy enforcement
5. Innovation, invention, deployment of low-carbon energy

Temperature Limits

- Why does so much policy discussion focus on 2°C target?
 - Where does 2°C come from?
 - 2°C above what?
 - Is there something special about 2°C?

History of Climate Agreements

Political Timeline

- 1979: World Climate Conference
- 1988: UN Resolution 43/53:

Protection of global climate for present and future generations of mankind

- IPCC established by WMO, UNEP
 - Review research; report on climate change science
- 1992: UN Framework Convention on Climate Change (UNFCCC)
 - Prevent “*dangerous*” interference with climate
 - Details left for future treaties
- 1997: Kyoto Protocol: Implements UNFCCC
- 2009: Copenhagen Accord
- 2015: Paris Accord

International Policy

- UNFCCC (1992):
 - Stabilize greenhouse gas concentrations to prevent “*dangerous*” interference with climate
 - “Lack of full scientific certainty should not be used as a reason for postponing such measures”
 - How do you define *dangerous*?
 - *Dangerous* compared to what?
 - Who should choose the definition?
 - Does this put scientists in the position of making value judgments for everyone else?

Kyoto Protocol (1997–2012)

- Emissions cuts:
 - “Common but differentiated responsibilities”
 - Industrialized nations (“Annex 1”)
 - Cut greenhouse gas emissions 5% or more below 1990 levels by 2008.
 - Transition nations (Former Soviet/Warsaw Pact):
 - Given more time to act
 - Developing nations (“Non-Annex”)
 - China, India, much of Africa, etc.
 - No obligations
 - Clean Development Mechanism
 - Incentive for developed nations to help less-developed nations to adopt clean energy, sustainable practices.

Copenhagen Accord (2009)

- No consensus on binding action
- Informal agreement to limit warming to 2° C
 - Encouraged non-binding national pledges to limit emissions
 - Brought attention to deforestation
 - Pledged \$30 billion over 3 years, rising to \$100 billion per year by 2020 from developed nations to support action by developing nations

Paris Accord (2015)

- Pledge to keep warming below 2° C, with aspiration to keep it below 1.5° C
- Nationally Determined Commitments to reduce emissions
 - Commitments fall far short of what's needed to achieve 2° C
- “Stocktaking” in 2023 and every 5 years thereafter to assess progress and adjust national commitments.

Analysis

Pielke on IPCC and Policy

- Detection vs. Attribution of Climate Change
 - Detection: “*Is climate changing?*”
 - Attribution: “***Why*** is climate changing?”
- IPCC has concluded that
 - Climate is changing (>99% certainty)
 - Last 30 years are the warmest in at least 1400 years (>66% certainty)
 - Human actions are causing most of the climate change observed in the last 50 years (>95% certainty)

Pielke on IPCC and Policy

- CO₂ as control-knob metaphor
 - Pielke: Too much emphasis on CO₂
 - Others: CO₂ is unique: magnitude and duration
 - See, Richard Alley, “The Biggest Control Knob: Carbon Dioxide in Earth’s Climate History” (Dec. 2009)

https://www.youtube.com/watch?v=RffPSrRpq_g

Pielke on IPCC and Policy

- Adaptation vs. Mitigation:
 - Bias against adaptation
 - Adaptation is necessary: “committed” warming
 - Limits to adaptation:
 - Deadly heat waves
 - Disruption of ecosystem services
 - Catastrophic sea-level rise
 - Less mitigation → more expensive adaptation
 - Find the best balance

Economics and the Social Cost of Carbon

Social Cost of Carbon

- Cost of doing nothing (different scenarios)
- Convert to cost-per-tonne of emissions
- Some people report cost per tonne carbon and others report cost per tonne CO₂

Note:

- tonne = metric ton = 2200 pounds = 1.1 English tons
- GT = gigatonne = billion tonnes
- 1 tonne C = 3.7 tonne CO₂

Social Cost of Carbon

Example:

- Emit 5500 GT CO₂ between now and 2100
(5500 GT CO₂ = 1500 GT C)
- Half stays in atmosphere, doubles CO₂ concentration
- Suppose climate change reduces world GDP by \$2 trillion per year for 100 years

$$\begin{aligned} \frac{\$2 \text{ trillion/year} \times 100 \text{ years}}{5500 \text{ GT CO}_2} &= \frac{\$200 \text{ trillion}}{5.5 \text{ trillion tonnes CO}_2} \\ &= \$36 \text{ per tonne CO}_2 \\ &= \$135 \text{ per tonne C} \end{aligned}$$

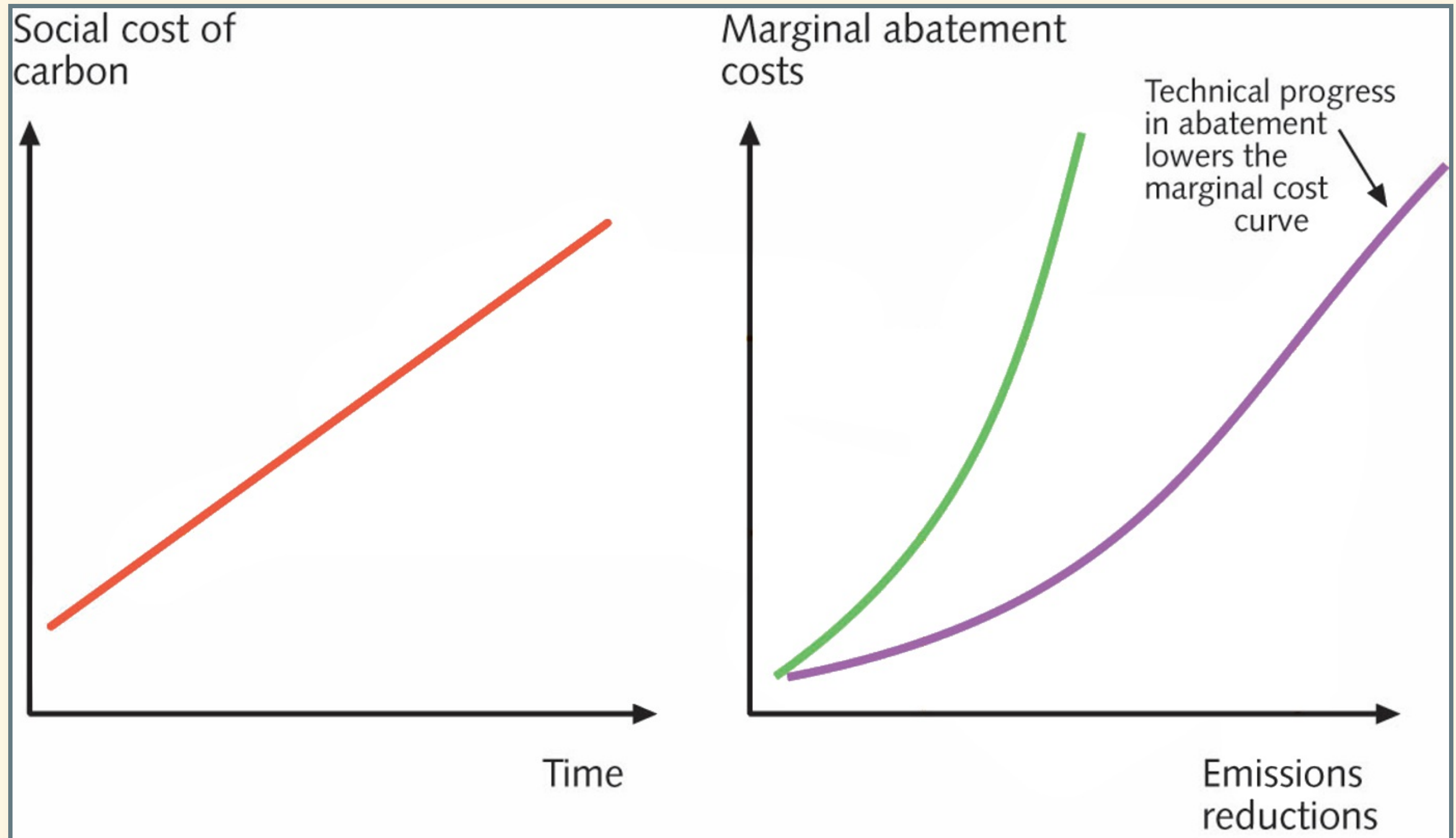
Social Cost of Carbon

- 1 gallon gasoline
 - 20 pounds CO₂ = 0.009 tonne CO₂
- \$1 per tonne CO₂ = \$0.009 per gallon
 - Roughly 1 cent per gallon
- A social cost of \$36 per tonne CO₂ means gasoline costs society roughly \$0.36 per gallon

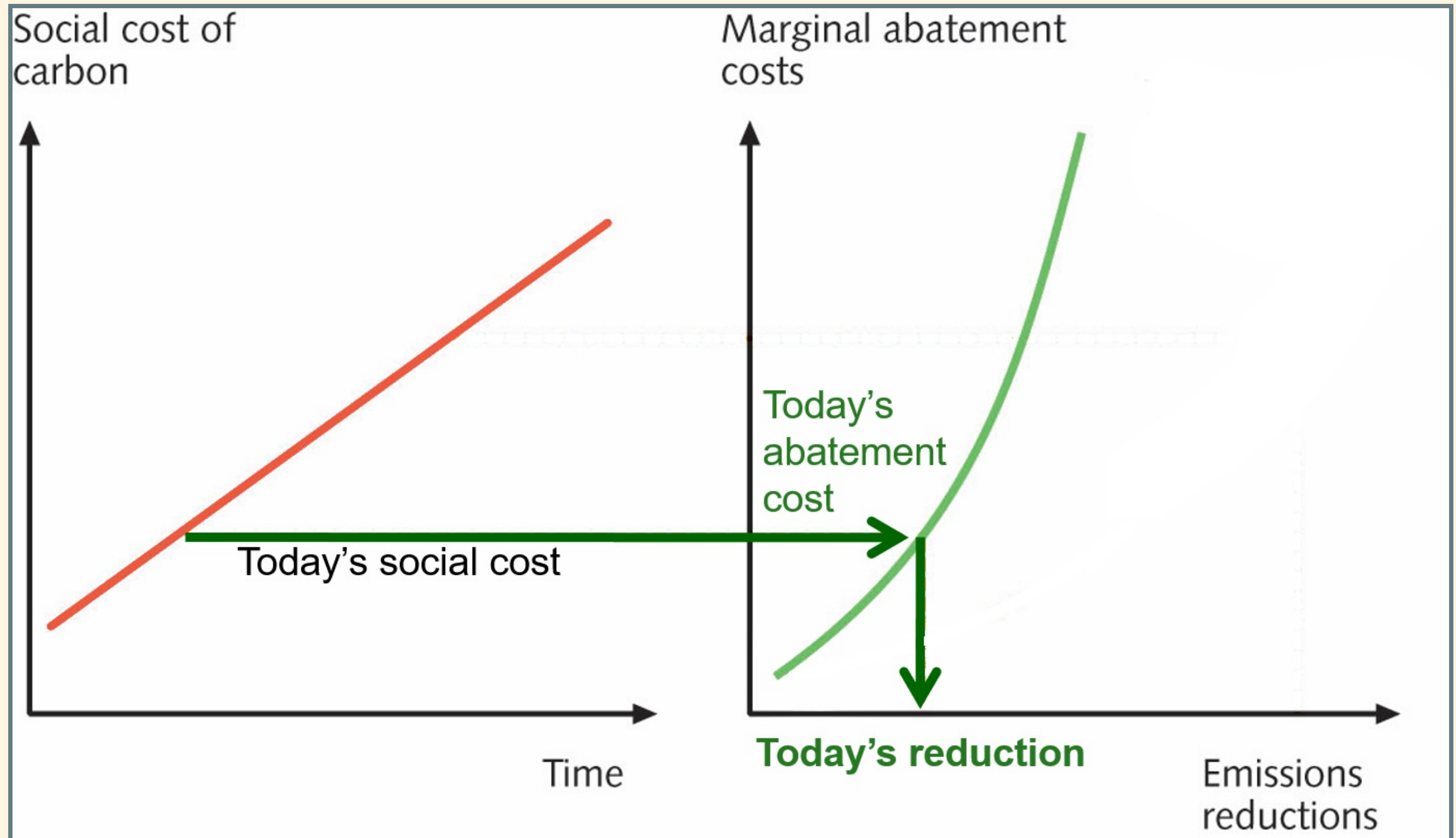
Social Cost of Carbon

- Social cost rises with CO₂ concentration
 - Small warming has very low social cost per tonne
 - Larger warming has high social cost per tonne
- Stern Report
 - \$85 per tonne CO₂ under BAU (\$0.77/gallon gas)
 - \$30 per tonne if we stabilize at 550 ppm (\$0.27/gallon)
 - \$25 per tonne if we stabilize at 450 ppm (\$0.22/gallon)
- Low concentrations of CO₂ = low social cost per tonne
 - but high cost of emissions reduction
 - Hard to justify
- Find best balance between social cost of warming versus cost of reducing emissions
- Cost of reducing emissions drops over time
 - Innovation, new technology

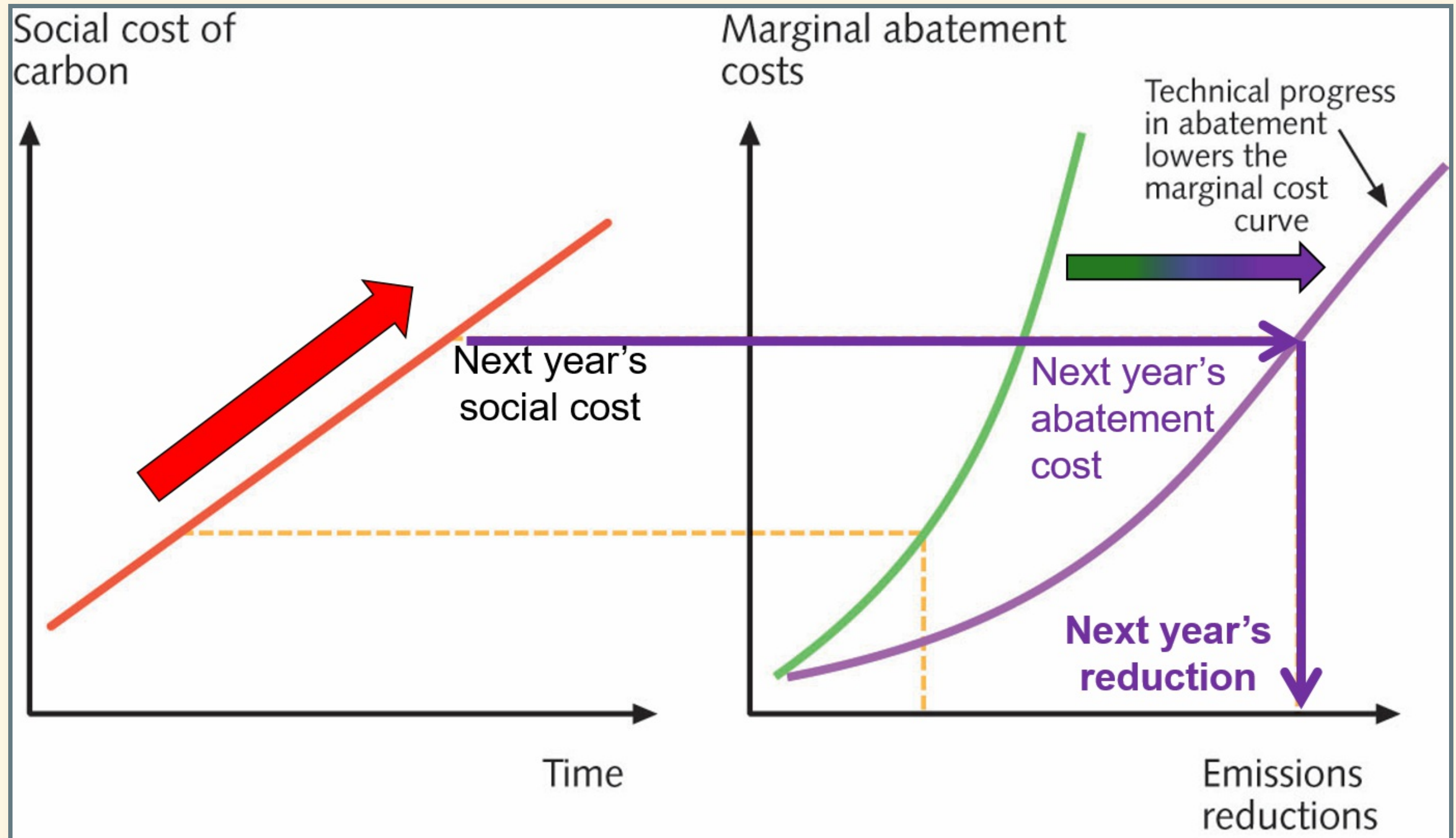
Why social cost is useful



Why social cost is useful



Why social cost is useful



Implications

- Optimum policy would begin with a low price on carbon today
 - Small emissions reductions in near-term
- Over time:
 - Cost of reducing emissions drops
 - Rising CO₂ concentration raises price of carbon
 - Emissions reductions become more aggressive