Osher Lifelong Learning Institute, Summer 2025

The Economics of Public Policy Issues

Northwestern University

Host: Geoffrey Woglom
Director, National Economic Education Delegation

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Available NEED Topics Include:

- US Economy
- Healthcare Economics
- Climate Change
- Economic Inequality
- Economic Mobility
- Trade and Globalization
- Minimum Wages
- Immigration Economics
- Housing Policy
- Federal Budgets
- Federal Debt
- Black-White Wealth Gap
- Autonomous Vehicles
- US Social Policy

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Course Outline

- **The Economics of Public Policy Issues**
  - Week 1 (7/8): Economic Update (including tariffs) (Geoffrey Woglom, Amherst College)
  - **Week 2 (7/15): Climate Change Economics (Sarah Jacobson, Williams College)**
  - Week 3 (7/22) The Economics of the Minimum Wage (Veronika Dolar, Pace University)
  - Week 4 (7/29): Cryptocurrencies (Joan Nix, Queens College (CUNY))
  - Week 5 (8/5): Saving Social Security (Jon Haveman, Exec Director, NEED)
  - Week 6 (8/12): Federal Debt and Deficits (Geoffrey Woglom, Amherst College)

Submitting Questions

- **Submit questions in the chat. I will try to address questions as they come up.**
- **We will do a verbal Q&A once the material has been presented.**
- **Slides will be available from the NEED website tonight: https://needecon.org/delivered_presentations.php**

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Climate Change Economics

Sarah Jacobson, Ph.D.
Williams College

Northwestern University

July 15, 2025

Credits and Disclaimer

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- **Disclaimer**
  - NEED presentations are designed to be nonpartisan.
  - It is, however, inevitable that the presenter will be asked for and will provide their own views.
  - Such views are those of the presenter and not necessarily those of the National Economic Education Delegation (NEED).

Outline

- Economic Building Blocks
- Climate Change
- Impacts of Climate Change
- Reducing Emissions
- Climate Change Policy
- Policy in Action

Economic Building Blocks

How Can Economists Help Fight Climate Change?

- By assessing behavioral reactions to climate change.
- By measuring climate change damages and estimating the costs of fighting climate change.
- By designing smart policies that minimize costs to society.

Econ 101: When Everything Is Simple, No Regulation Is Needed for Efficiency

- Simple transactions: buyer and seller feel all costs and benefits of sales
- They choose based on the costs & benefits they feel
- → Efficient number of transactions! (Maximizes social benefits)

When Our Decisions Affect Others, We Need Regulation

- **Pollution causes an EXTERNALITY: a side effect (here, a cost) that affects someone else**
  - Polluting things have an "unfair cost advantage" because part of cost is offloaded on others
  - → Too much pollution is generated
  - Regulation limiting pollution has net benefits
- ***The "efficient" amount of pollution balances costs & benefits of pollution***

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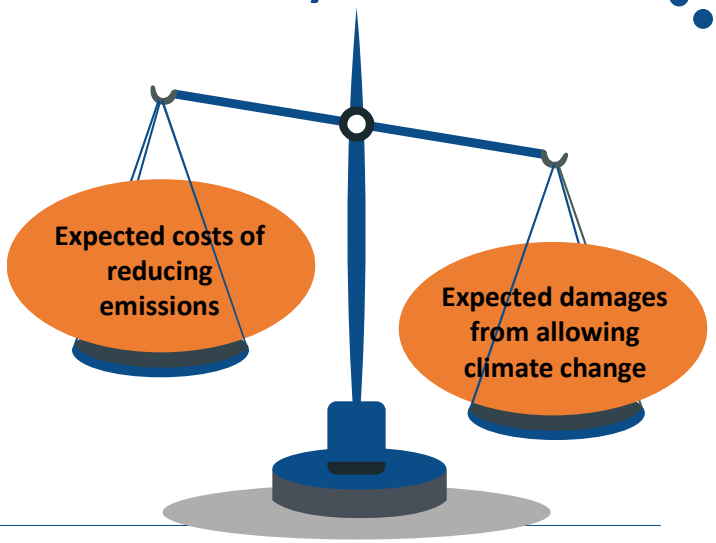
How Economists Decide How Much to Fight Climate Change: Cost Benefit Analysis

Abating greenhouse gas emissions is costly…

… but without action, climate change damages are even more costly.

Goal is not zero emissions, but efficient level that achieves a balance.



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Cost-Benefit Analysis of Fighting Climate Change

- **Most economic models suggest the costs of keeping warming below 2°C are relatively small, amounting to 1-4% of GDP by 2030.**
- **Costs of acting to keep warming below 2°C are almost certainly less than future economic damages they would avoid.**
  - Damages estimated to be between: **7-20% of worldwide GDP.**

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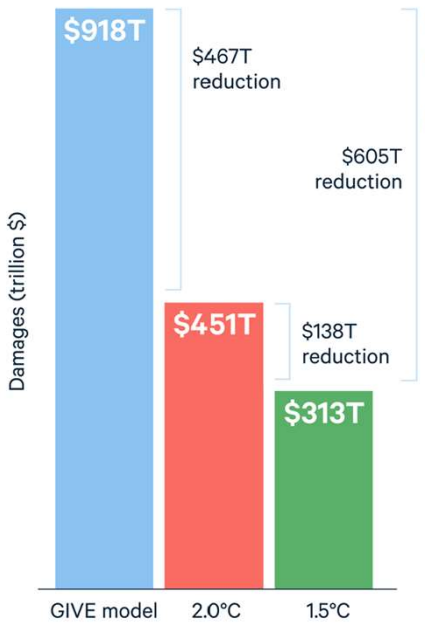
Newer Estimates of Benefits of Fighting Climate Change

- **Policies already declared should limit warming to 2.5°C**
- **Keeping warming even lower would yield additional global benefits of:**
  - 2° → $5.2T annually ($467T total)
  - 1.5° → $6.8 trillion annually (605T total)



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Climate Change

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A Climate Change Ladder

- Emissions
- Mitigation (a.k.a. Abatement)
- Adaptation
- Damages

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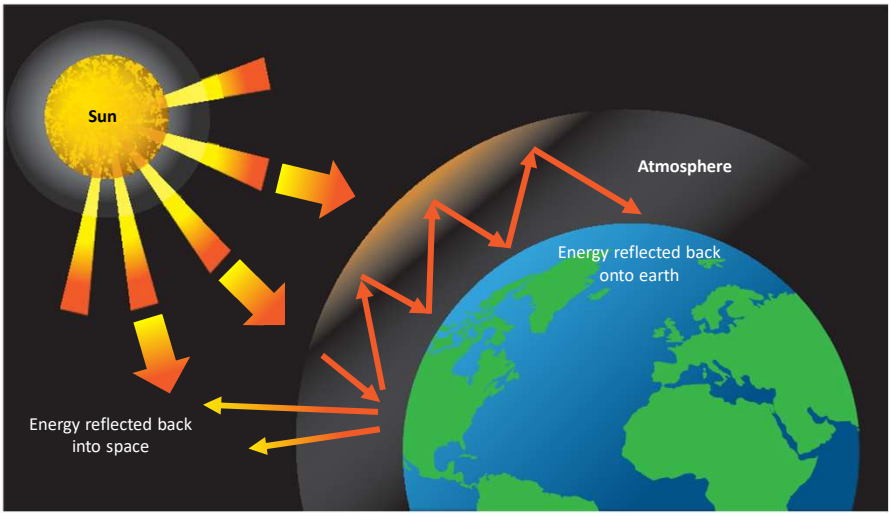
The Atmospheric Greenhouse Effect



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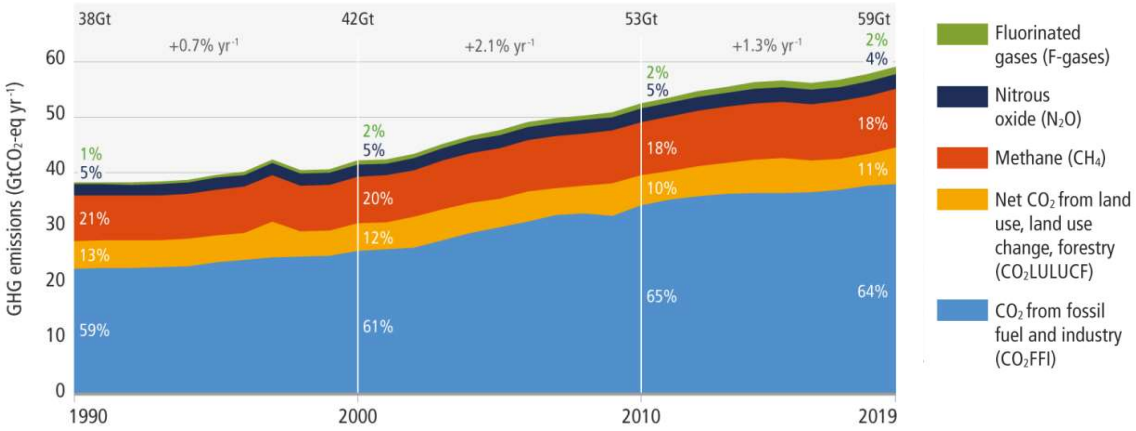
Greenhouse Gas Emissions 1990-2019

a. Global net anthropogenic GHG emissions 1990–2019 (6)



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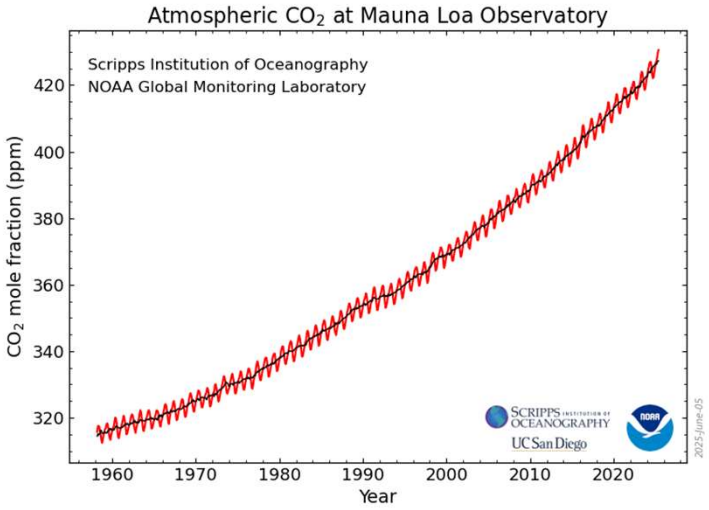
Source: IPCC

Atmospheric CO_2 Concentrations Up To Now



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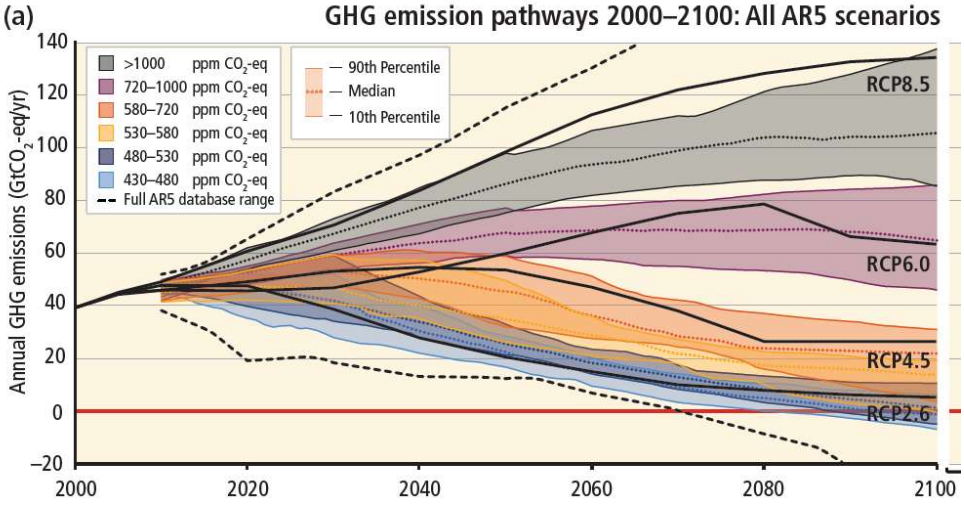
Source: NOAA

Emissions Trajectories into the Future



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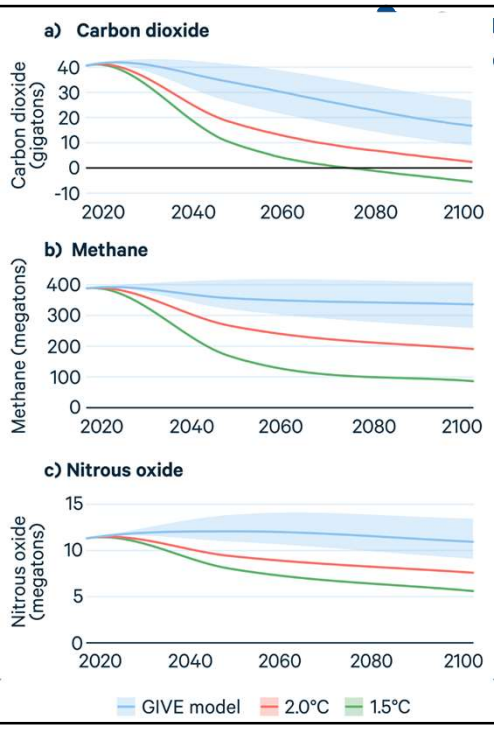
Source: IPCC Assessment Report 5

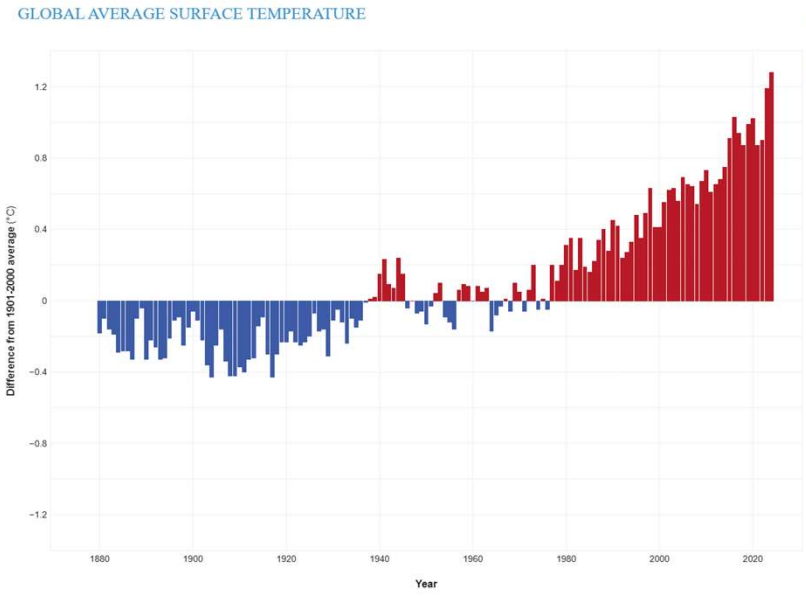
Newer Estimates

- Pathways of greenhouse gas emissions to keep warming below 2° or 1.5°C



Global Temperatures are Already Changing

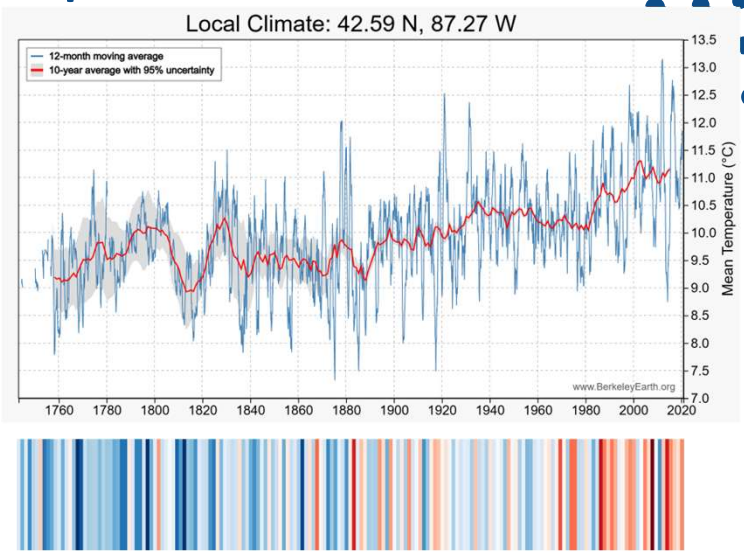
Surface temperatures have increased 1.29°C already as of 2024



And So Are Local Temperatures

Use https://berkeleyearth.org/temperature-city-list/ to see the temperature history of an area!

Here's Chicago!



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Impacts of Climate Change

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What Do Greenhouse Gas Emissions Do to the Planet?

- **Increased temperatures**
  - Sea level rise
  - Storm surges
- **Altered precipitation patterns**
- **More variable weather**
- **More / more powerful storms**
- **Carbon dissolves in ocean**

How Climate Change Affects Humans

- **Agriculture**
- **Fisheries**
- **Coastal damages**
- **Direct health effects, including sickness and death (temperature & drought; also pollution)**
- **Indirect health effects (vector-borne disease)**
- **Reduced fresh water availability**
- **Wildfires**
- **Shifting zones for important ecosystems, and desertification**
- **Reduced worker productivity**
- **Increased violence**
- **Some of these may cause human migration and/or conflict**

Social Cost of Carbon (SCC)

- **The expected cost of damages from each unit of greenhouse gas emissions**
- **Should increase over time**
- **EPA used ~$51 per metric ton of CO_2 until 2024**
  - About $157/car per year.
  - $32 billion for all vehicles in the US.
- **In 2024, adopted new estimate: $190**
- **2025: EPA proposes elimination of SCC**

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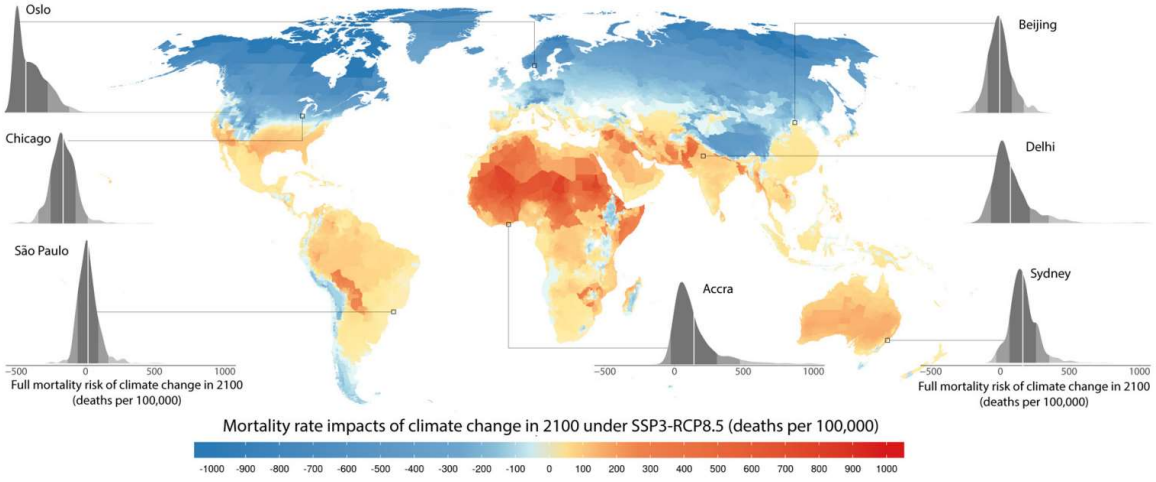
How Damages Will Vary Globally: Mortality as an Example



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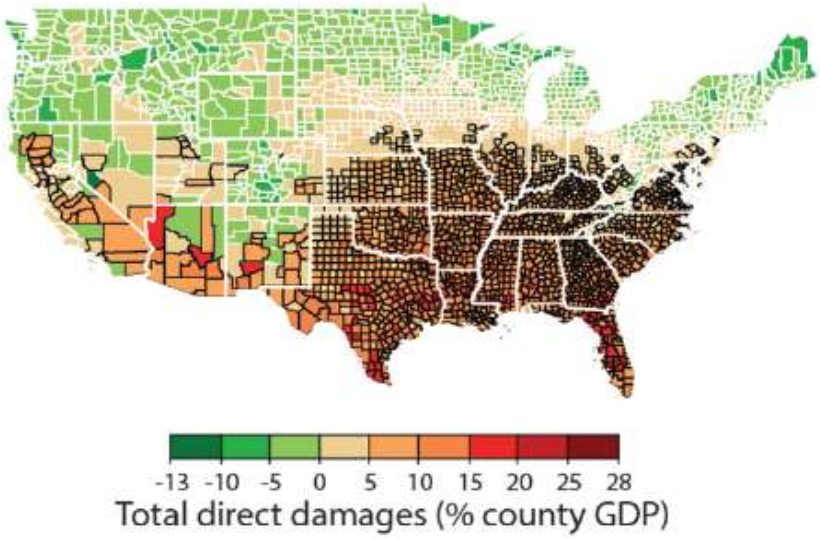
How Damages Will Vary in the US



Adaptation Reduces Damages

- *Adaptation*: costly action that reduce damages from climate change.
- The net damage cost to society is the cost of adaptation plus the cost of remaining damages.
- People and firms will take some actions on their own, up to the point where they find it worthwhile.
- Some adaptation requires government involvement.

Individual-Level Adaptation

- **Perhaps you…**
  - Stay inside more.
  - Turn on the air conditioning.
- **Farmers may:**
  - Plant at different times.
  - Plant new crops.
- **Businesses may:**
  - Give outdoor workers water / shade breaks.
- **Everyone might:**
  - Think about moving to a safer place.

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Public Adaptation

- **Governments can help:**
  - When collective action is less costly than everyone acting alone.
  - When individual action is not possible or likely.
  - When some people can't protect themselves.
- **Sea walls**
- **Ecosystems that provide protection**
- **Policies that protect workers or low-income and vulnerable populations**
- **Planned retreat (moving a community)**

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Reducing Emissions

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Global Net Emissions Are What We Care About

- **For climate impacts, we don't care where they are emitted, only how much**
  - There may be other local impacts
- **Gross emissions (greenhouse gas sources): how much greenhouse gases (including CO2) we put out**
- **Greenhouse gas sinks: ways to pull CO2 out of the air**
  - Existing: oceans, forests
  - Increase sinkage by planting trees, or other measures

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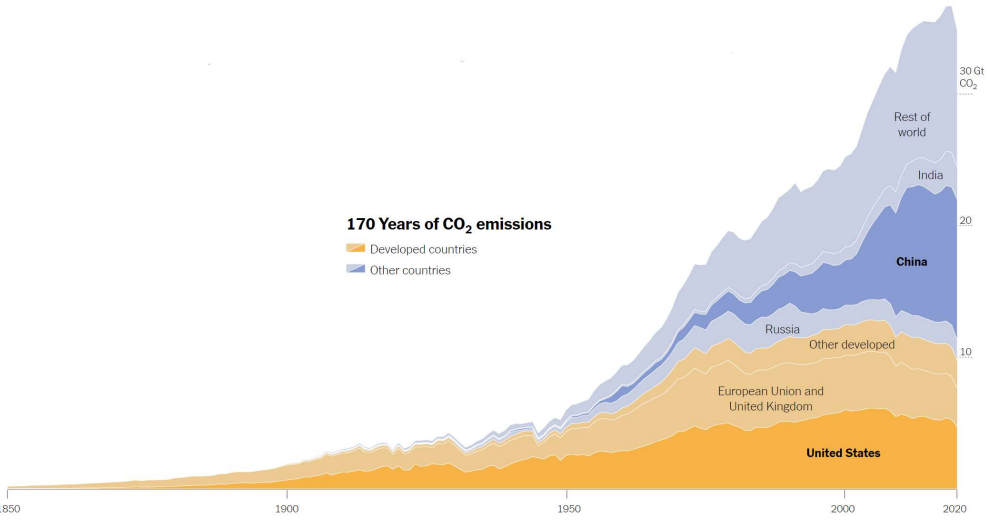
Sources of the Global Flow of Emissions



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Sources of the Global Stock of Emissions

23 rich, developed countries are responsible for half of all historical CO_2 emissions.

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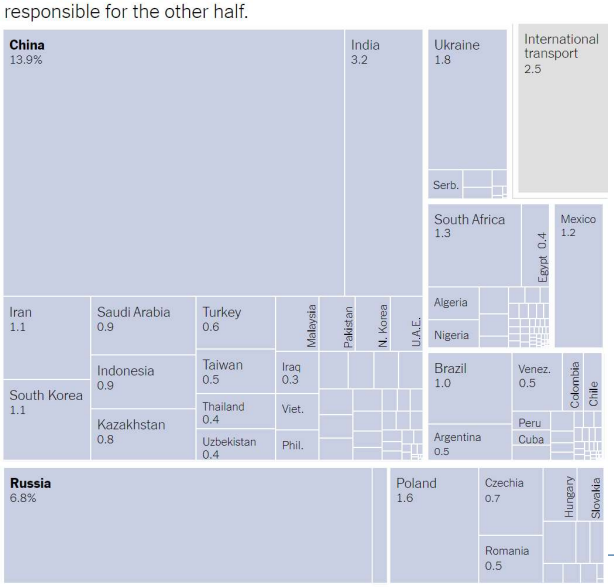
Sources of the Global Stock of Emissions

More than 150 countries are responsible for the other half.



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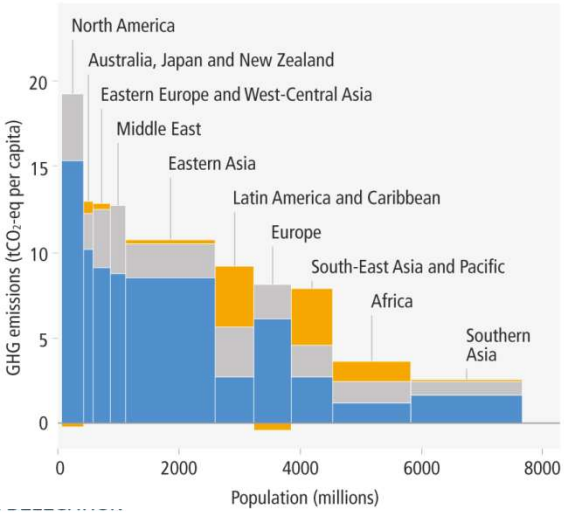
How Does This Look Per Capita (Per Person)?

c. Net anthropogenic GHG emissions per capita and for total population, per region (2019)



Fossil fuel and industry (CO_2FFI)

Net CO_2 from land use, land use change, forestry (CO_2LULUCF)

Other GHG emissions

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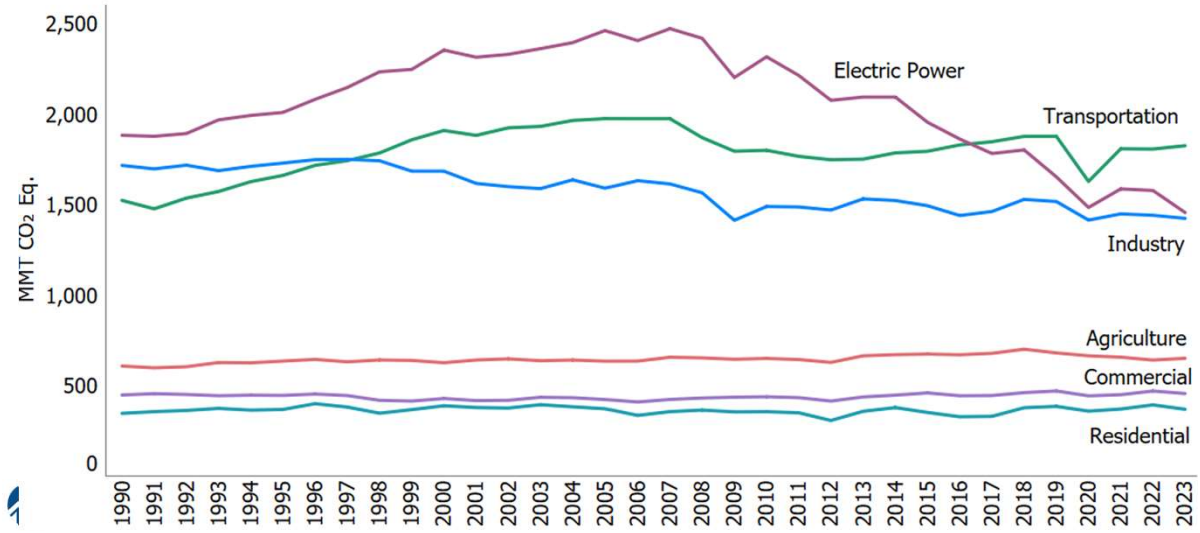
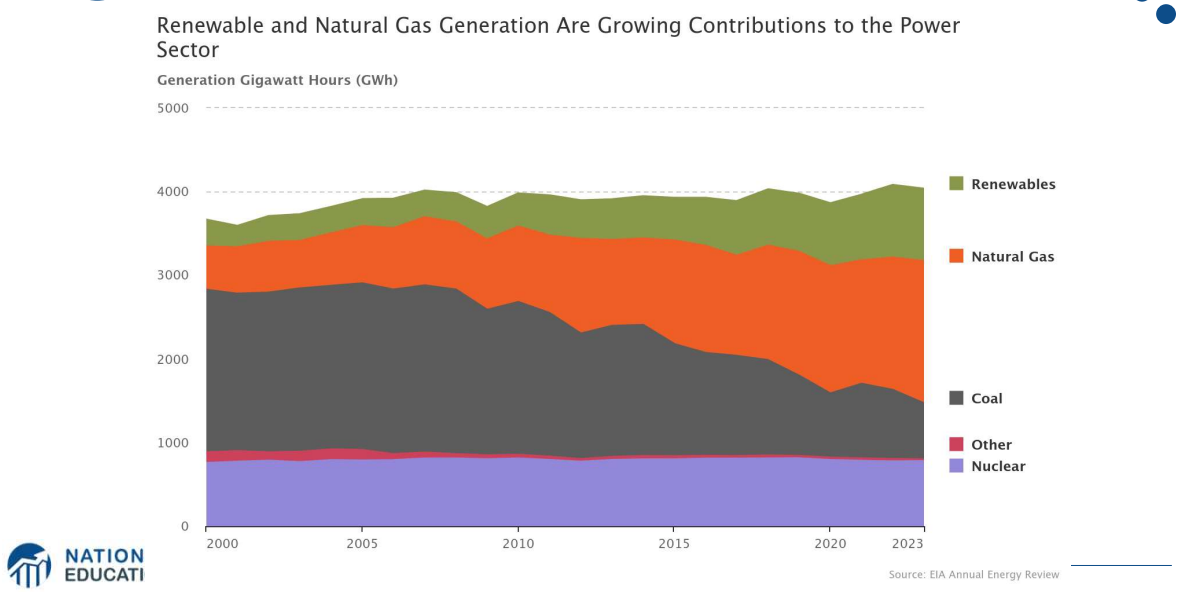
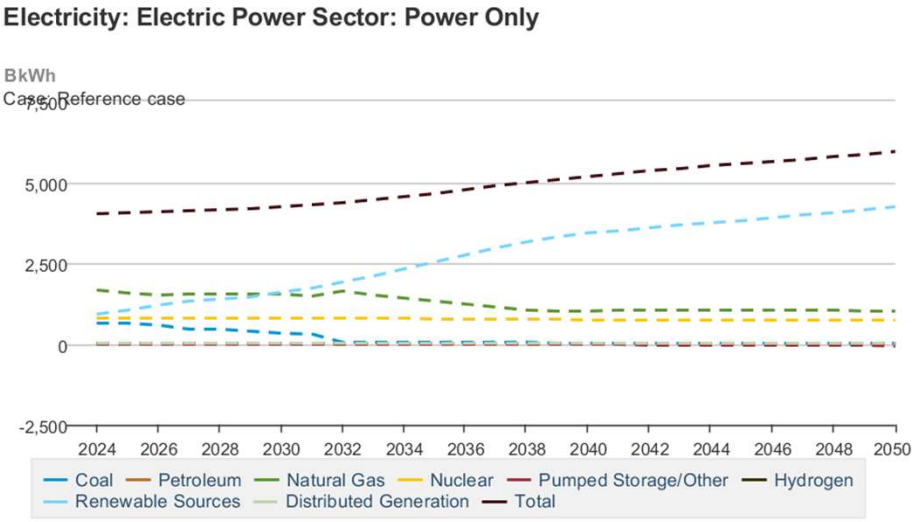
Total US Greenhouse Gas Emissions by Economic Sector through 2023



US Electricity Sources for the Last 25 Years



US Electricity Sources - Future Projections



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Which Emissions Should We Cut?

- **List all possible ways to reduce emissions**
- **Figure out how much each can reduce in total**
- **Figure out how much each costs per unit of emissions reduced**
- **Line them up in order: cheapest to costliest ("marginal abatement cost curve")**
  - → Tackle first the cheapest ones!

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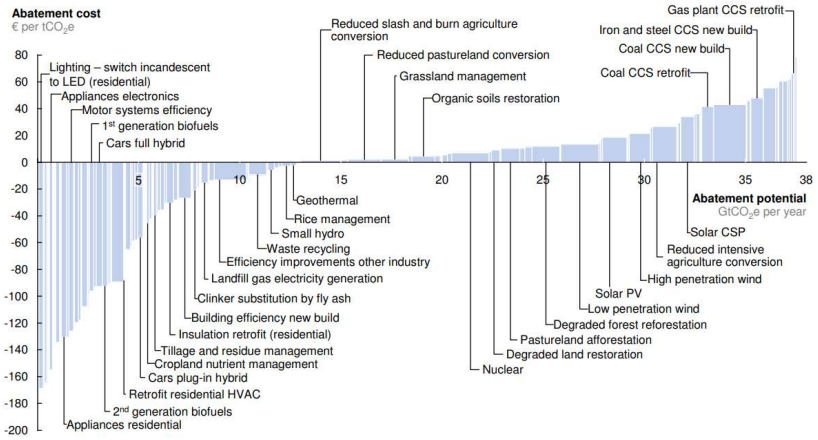
Example Abatement Cost Curve

(Don't trust these numbers, this is just to show the idea)

V2.1 Global GHG abatement cost curve beyond BAU – 2030



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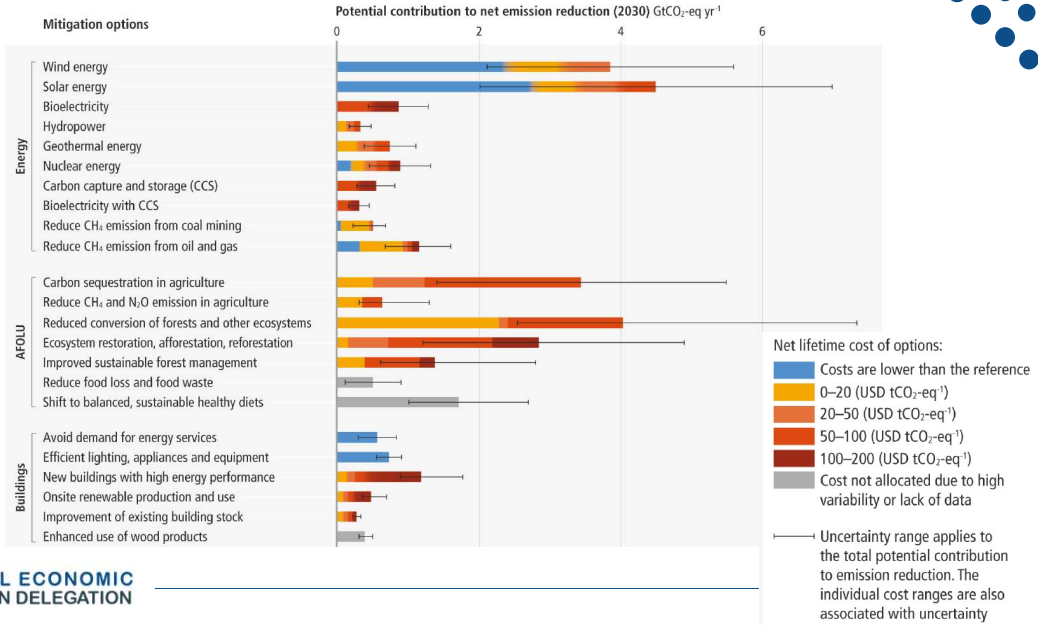
Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €80 per tCO_2e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.

Source: Global GHG Abatement Cost Curve v2.1

Newer Estimated Abatement Cost Curve



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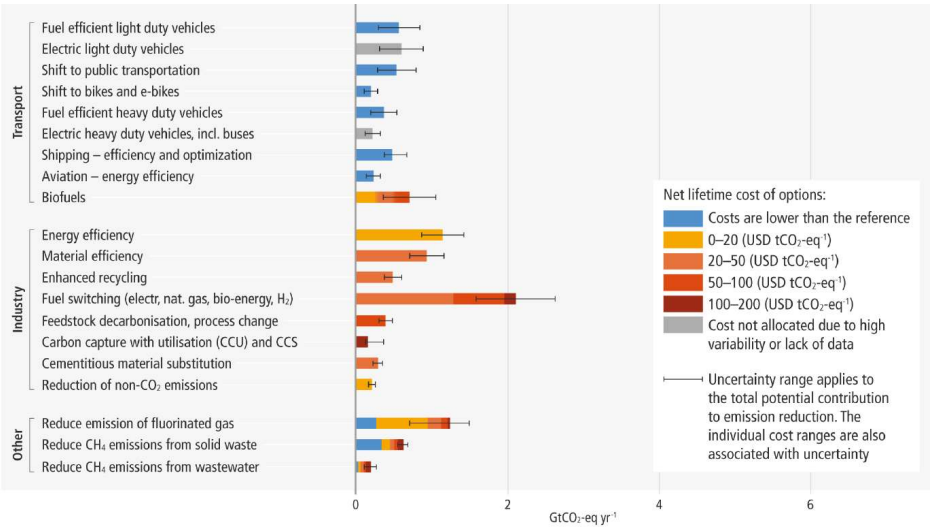
Newer Estimated Abatement Cost Curve



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Costs and Barriers Can Be Difficult to Assess

- **Difficult to project future costs for new technology**
  - Costs of renewables have been dropping fast
- **Investments in research and development and infrastructure (e.g., EV charging) can lower future costs**
- **Barrier to expanding renewable energy: intermittency**
  - Battery technology under development

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Geoengineering and Carbon Capture

- **Technical pathways to reduce climate change without reducing emissions**
- **Carbon capture: captures CO2 emissions and stores them or "utilizes" them (for energy, pressure, etc.)**
  - Not yet proven at scale
- **Solar geoengineering: make the atmosphere reflect more light to regain earlier thermal balance**
  - Totally theoretical
  - Potentially risky

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Climate Change Policy

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Policies That Reduce Emissions Directly

- **Command and control regulation**
  - Emissions standards or limits (e.g., Clean Water Act discharge limits)
  - Tech standards (e.g., require scrubbers on power plants)

- **Incentive-based policies**
  - Putting a price on emissions – leveling the playing field!
    - Tax or cap & trade
    - Subsidizing green energy (*e.g.*, feed-in tariffs)

Command and Control vs. Incentive-Based Regulation

- **Efficiency**
  - Both can achieve the same amount of emissions reduction.
  - Incentive-based policies can achieve emissions reduction at much lower cost.
- **Equity**
  - Both have may regressive impacts (low-income families bear costs that are a larger percent of their incomes vs hi-income families)
    - However, new evidence increasingly questions this.
  - Cap and trade and carbon tax can generate revenues that can be used to offset the regressivity.
    - E.g.: “carbon dividend”
  - Command and control regulations do not.

How Does a Carbon Tax Work?

- **Choose activities to be covered (e.g., electricity sector, all emitters, etc.).**
- **Set tax level.**
  - Optimally, it represents the social cost of polluting.
- **Polluters must pay a tax for every unit emitted.**
  - Polluters with **low** abatement costs will **abate** to avoid the tax
  - Polluters with **high** abatement costs will pollute and **pay the tax**

How Does Cap and Trade Work?

- **Choose activities to be covered (e.g., electricity sector, all emitters, etc.).**
- **Set maximum emissions level ("cap").**
- **That many pollution permits are issued.**
  - Can be auctioned off or given to polluters
- **Every polluter in a covered sector must have a permit for every unit of pollution.**
- **Polluters buy and sell ("trade") permits on a market as they wish.**
  - Polluters with **low** abatement costs will make / save money by **abating** and selling / not buying permits
  - Polluters with **high** abatement costs will buy permits and **pollute**

Examples of Other Policies that Reduce Emissions

- Research and development subsidies
- Renewable energy mandates (e.g., renewable portfolio standards)
- Energy efficiency mandates and subsidies (e.g. CAFE fuel economy standards)
- Grid / infrastructure improvements
- Public transportation
- Land use / zoning policies

Climate Change Policy in Action

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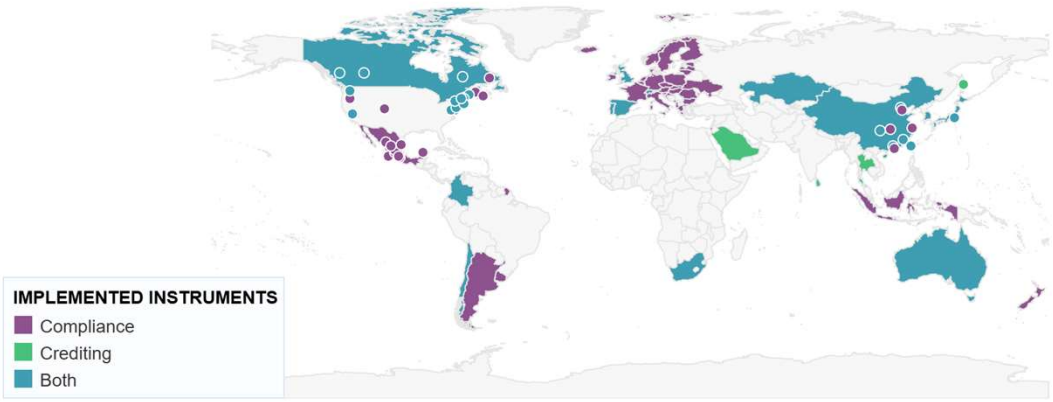
Incentive-Based Climate Policies Right Now

Carbon pricing instruments around the world, 2025

Map shows jurisdictions that have implemented Direct Carbon Pricing Instruments - Compliance instruments (Emissions Trading Systems (ETS) and Carbon taxes) and/or domestic carbon crediting mechanisms, subject to any filters applied. The year can be adjusted using the slider below the map.



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Source: World Bank Carbon - Pricing Dashboard

California's Cap and Trade System Since 2013

0.7%

of global greenhouse gas emissions

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California's AB32: Global Warming Solutions

- **Passed in 2006**
- **California's goals:**
  - Reduce emissions to 1990 levels by 2020
  - An 80% reduction in emissions from 1990 levels by 2030
- **California's Tools:**
  - Cap and Trade
  - Renewable Portfolio Standard
  - Clean Cars Program
  - Low Carbon Fuel Standard

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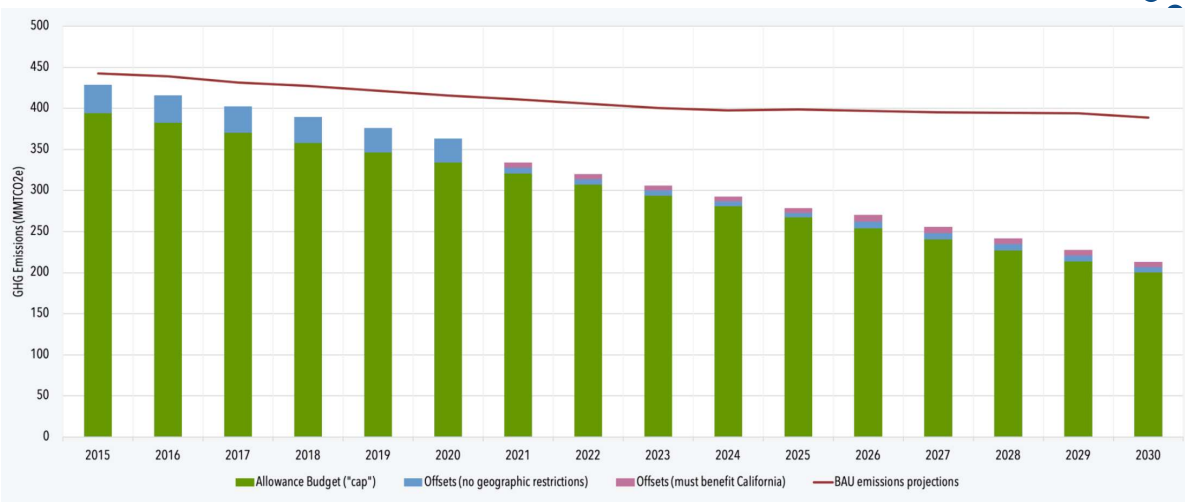
Emissions Cap Designed to Tighten over Time



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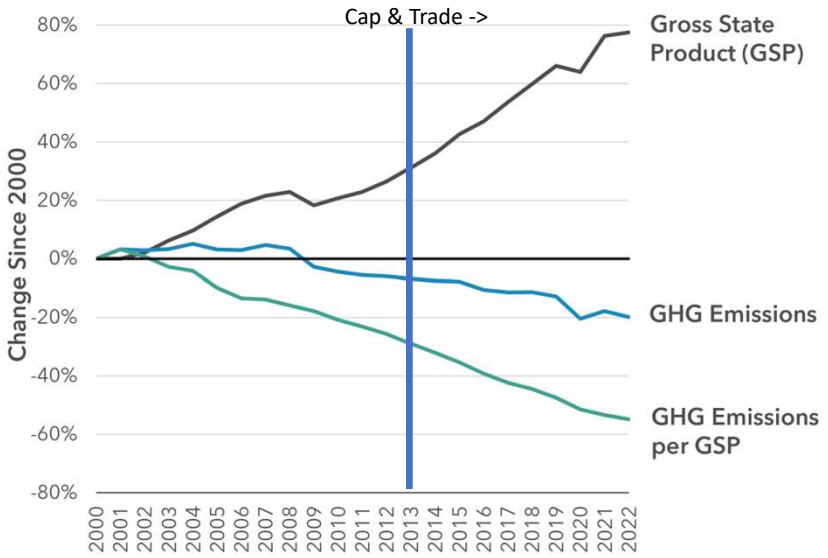
Changes in California Gross State Product and GHG Emissions since 2000



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Summary

- **Climate change is real, is caused by human actions, and has impacts we're already feeling.**
- **This problem won't solve itself; we need policy intervention, and fast.**
- **Smart policy can reduce greenhouse gas emissions by the right amount and at the lowest possible cost.**
  - For example, cap and trade and emissions taxes!
- **We also need policies to help with adaptation and support those bearing the greatest damages.**

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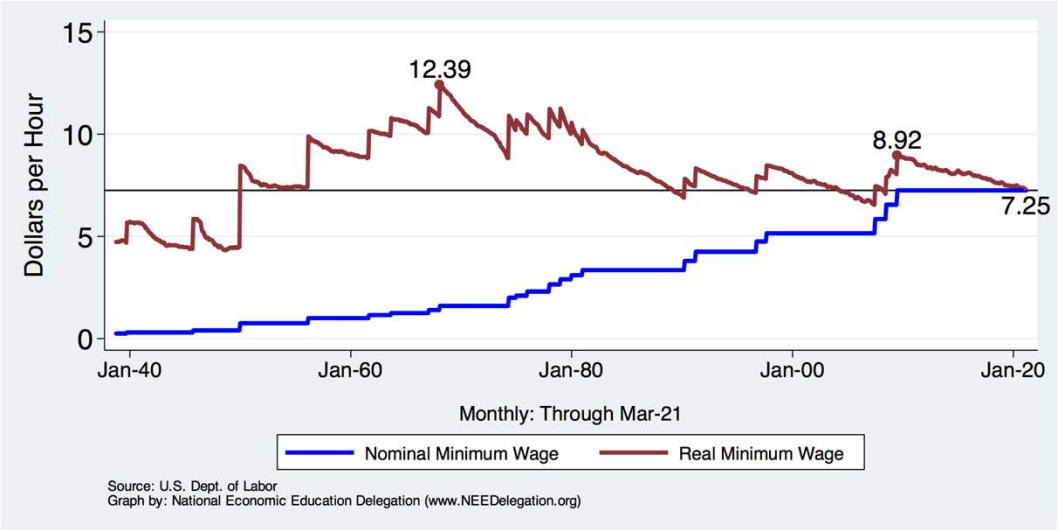
Next Week: History of the Minimum Wage



Thank you!

Any Questions?

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