


Climate Change Economics

Jon Haveman, Ph.D.

Marvelous Marin Breakfast Club

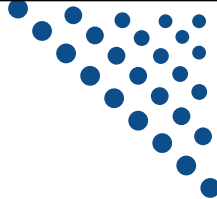
November 7, 2019




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National Economic Education Delegation

- **Vision**
 - One day, the public discussion of policy issues will be grounded in an accurate perception of the underlying economic principles and data.
- **Mission**
 - NEED unites the skills and knowledge of a vast network of professional economists to promote understanding of the economics of policy issues in the United States.
- **NEED Presentations**
 - Are **nonpartisan** and intended to reflect the consensus of the economics profession.





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Who Are We?

• Honorary Board: 44 members

- 2 Fed Chairs: Janet Yellen, Ben Bernanke
- 6 Chairs Council of Economic Advisers
 - o Furman (D), Rosen (R), Bernanke (R), Yellen (D), Tyson (D), Goolsbee (D)
- 3 Nobel Prize Winners
 - o Akerlof, Smith, Maskin

• Delegates: 365 members

- At all levels of academia and some in government service
- All have a Ph.D. in economics
- Crowdsource slide decks
- Give presentations

• Global Partners: 42 Ph.D. Economists

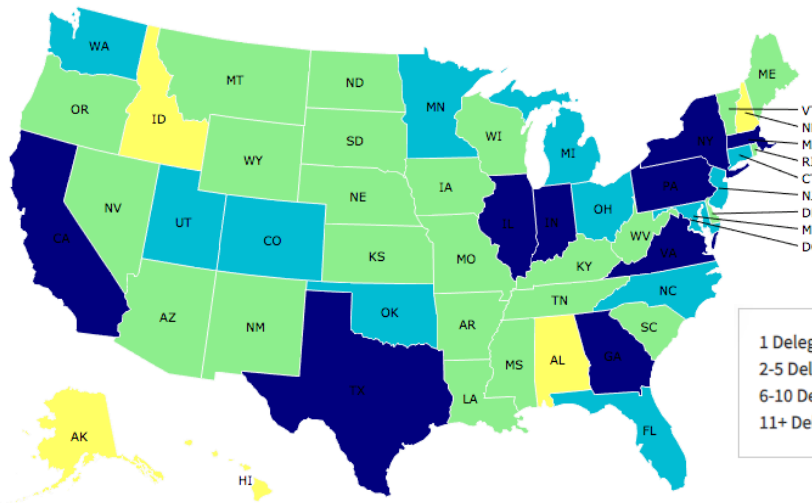
- Aid in slide deck development



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Where Are We?



1 Delegate - Yellow
 2-5 Delegates - Green
 6-10 Delegates - Light Blue
 11+ Delegates - Blue



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Credits and Disclaimer

- **This slide deck was authored by:**
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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).



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How Can Economists Contribute to Thinking about Climate Change?

- **By assessing behavioral reactions to climate change.**
- **By measuring the damage and estimating the economic costs of fighting climate change.**
- **By designing smart policies that minimize costs.**
 - Balance economic growth with GHG emission mitigation.



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Outline

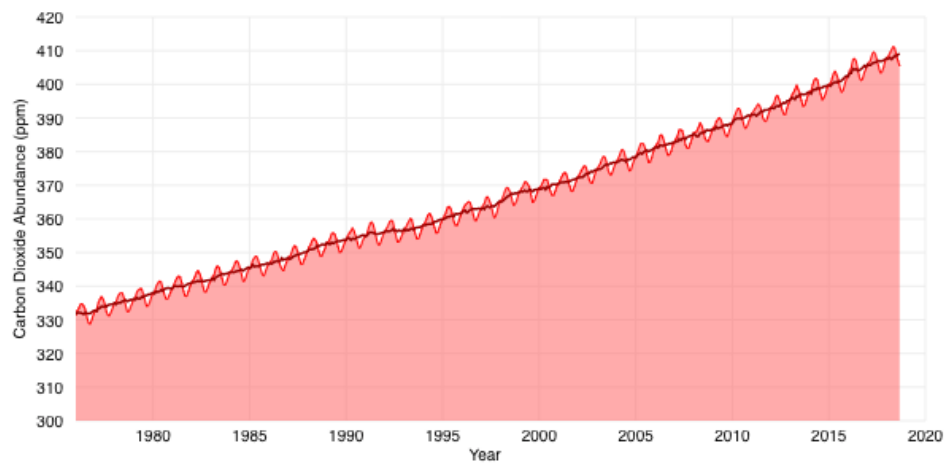
- Climate change science
- Impacts of climate change
- Economics of responding to climate change
- Addressing the sources of our emissions
- Climate change policy
- Policy in action



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Atmospheric CO₂ Concentrations

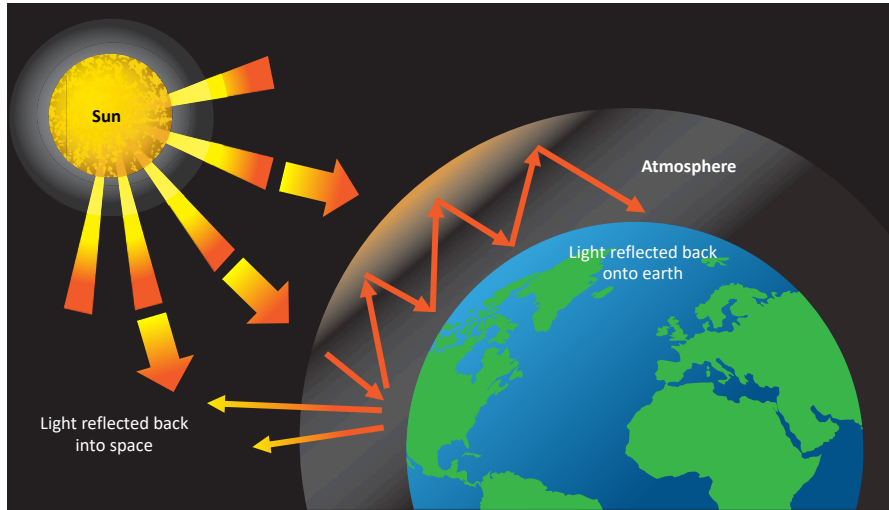


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Source: IPCC data distribution center
and climate.gov

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The Atmospheric Greenhouse Effect



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Uncertainty

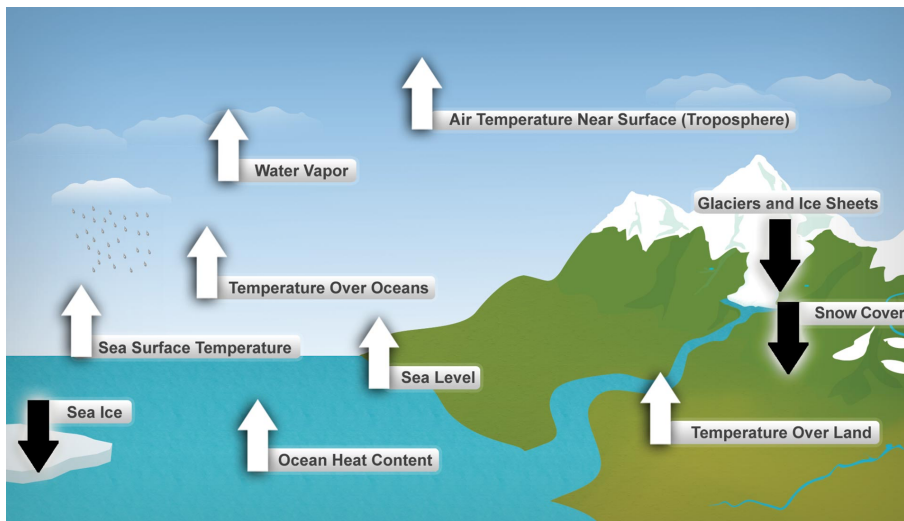


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Impacts of Climate Change

Global Warming Indicators



How These Impacts Affect 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



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Adaptation Reduces Damages

- Human *adaptations* are costly actions that can reduce damages from climate change.
- The **net cost to society** is the **cost of adaptation** plus the **cost of the remaining damages**.
- People will take some actions on their own, up to the point where they find it worthwhile.
- Some responses require government involvement: large-scale actions or actions with shared benefits.
- Adaptation is already underway.



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Social Cost of Carbon

- Cost above price paid.
- The expected cost of damages from each unit of greenhouse gas emissions.
- Current EPA estimate: ~\$40 per metric ton of CO₂.
 - About \$123/car per year.
 - \$26 Billion for all vehicles in the US.
- Social cost of carbon will increase over time.



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Economics of Responding to Climate Change

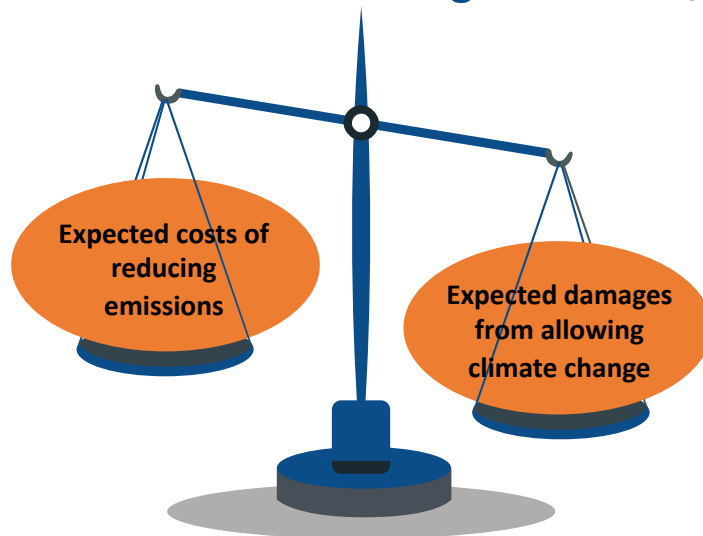


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How Economists Decide How Much to Fight Climate Change

- Cost Benefit Analysis
- Weigh:



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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**.
- **Caveats:**
 - Putting a monetary value on priceless things
 - Inequality
 - Uncertainty and risk

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This is What Precisely Wrong Looks Like

San Francisco Airport

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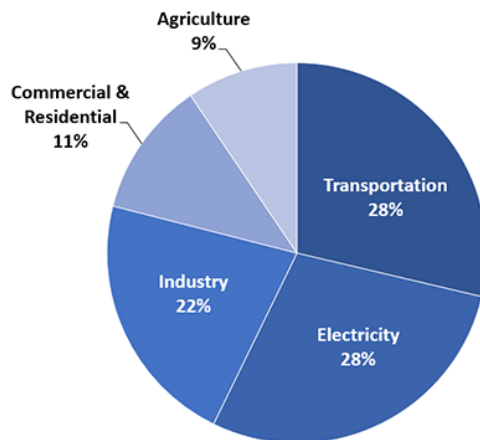
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Addressing the Sources of Our Emissions



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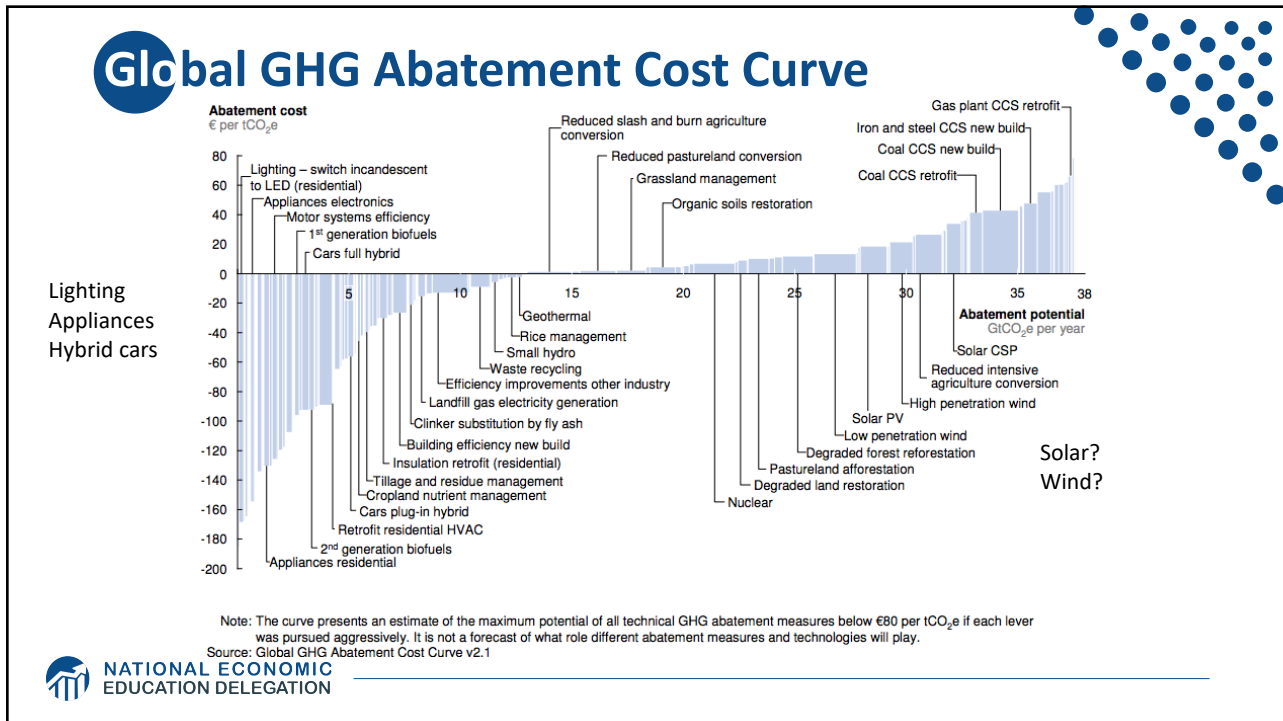
Total U.S. Greenhouse Gas Emissions by Economic Sector in 2016



U.S. Environmental Protection Agency (2018). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016



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Climate Change Policy

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Policies That Reduce Emissions: Directly

- **Regulation**

- Emissions standards or limits
 - o E.g., CAFE standards

- **Market-oriented policies**

- Putting a price on emissions
 - o Subsidizing green energy (*e.g.*, feed-in tariffs)
 - o Tax or cap & trade



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How Does Cap and Trade Work?

- **Activities to be covered are determined.**
- **Acceptable emissions levels are indicated.**
- **“Permits” that allow acceptable emissions levels are issued.**
 - How?
 - o According to historical emissions?
 - o Evenly across emitters?
 - o Sold at some price?
- **A “market” is developed.**
- **Those desiring to emit will have to buy sufficient permits to accommodate their emissions.**
- **Those wishing to abate will offer their permits on the “market”.**
 - The price of a permit indicates:
 - o The benefit of eliminating further emissions.
 - o The cost of emitting.
- **Gov’t agency determines equality of permits in possession and emissions.**



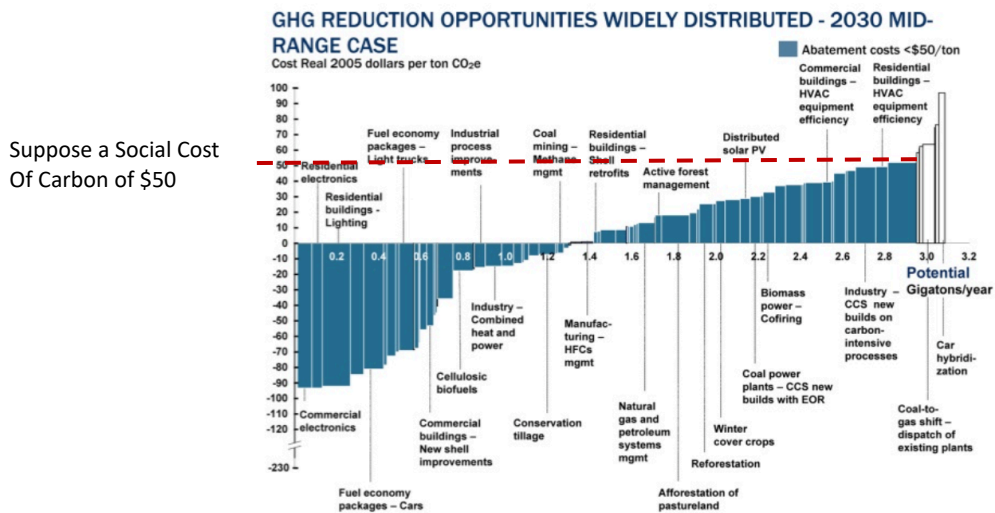
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How Does a Carbon Tax Work?

- Activities to be covered are determined.
- The price of emissions is determined.
 - Presumably some relation to the social cost of polluting.
- Emissions are measured.
- Taxes are determined.
- Q: What to do with the tax revenue?

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Putting a Price on Carbon



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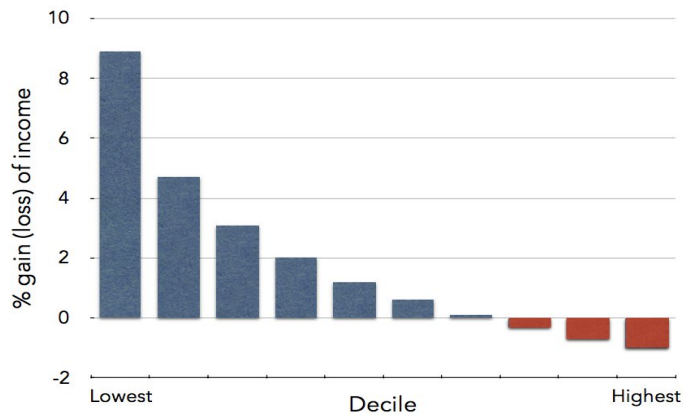
Carbon Prices: the Good and Bad

- **Good:**
 - Provide price signal to lower emissions.
 - They yield low-cost reductions in emissions.
- **Bad:**
 - Firms might leave to flee regulation.
 - It is necessary to monitor emissions.
 - Regressive
 - Costs weigh more heavily on low-income people.



Revenue Dividend Eliminates Regressivity

IMPACT OF CARBON DIVIDENDS ON U.S. FAMILY INCOMES



Carbon Tax and Cap & Trade: the Differences

	Carbon Tax	Cap & Trade
Carbon Price	Certain	Uncertain
Emissions	Uncertain	Certain
Ease of Implementation	May be easier to implement	
Additional concerns	Always generates revenue May require legislation to change Predictability	Susceptible to lobbying Only generates revenue if government sells permits Cap can be changed by regulator Less certainty over future

Thoughts on Regulation vs Market-Oriented

• Equity.

- Both types of policies are regressive
 - Cap and Trade and a Carbon Tax both have the ability to offset the regressive nature of reducing carbon emissions.
 - Regulations do not.

• Efficiency

- Market-oriented policies tend to achieve emissions reduction at much lower cost.
 - Example: CAFÉ Standards vs Carbon Tax
 - Tax is significantly more efficient.
 - Why?

Policies That Reduce Emissions: INDirectly

- Subsidizing R&D
- Grid / infrastructure
- Land use policies
- Energy efficiency mandates and subsidies
- Mandating renewable energy (*e.g.*, renewable portfolio standards)



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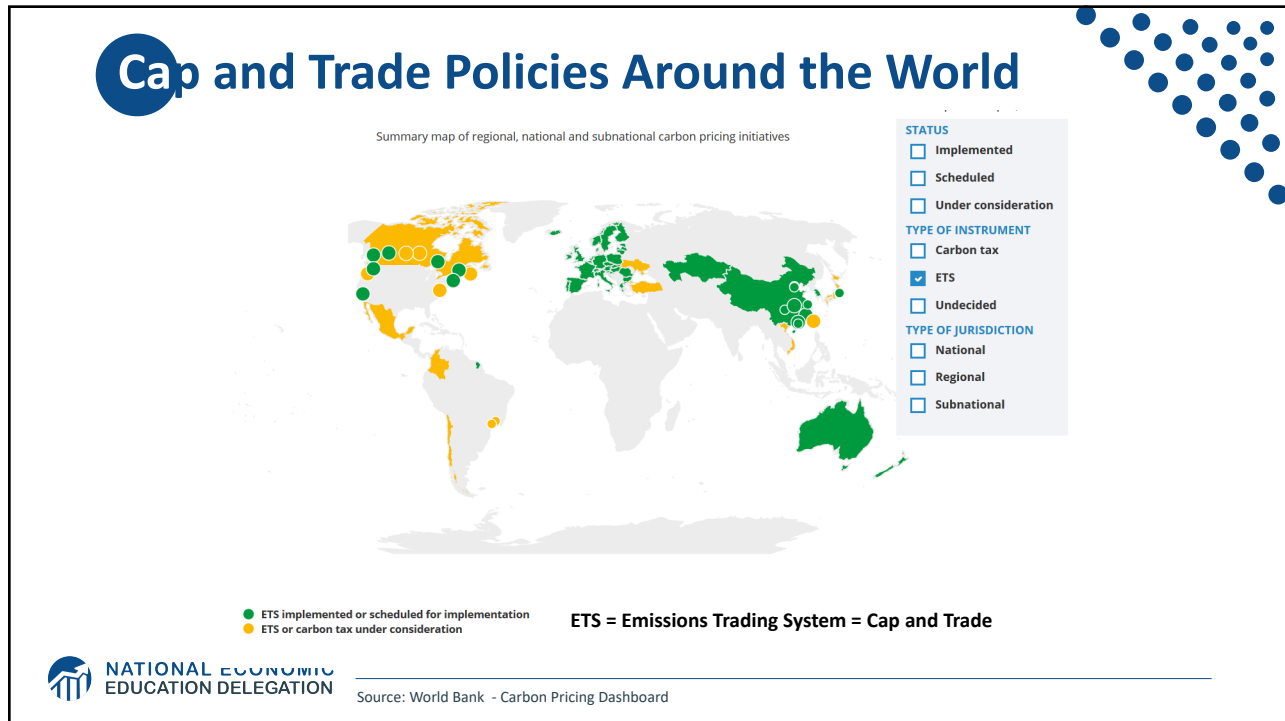
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Climate Change Policy in Action

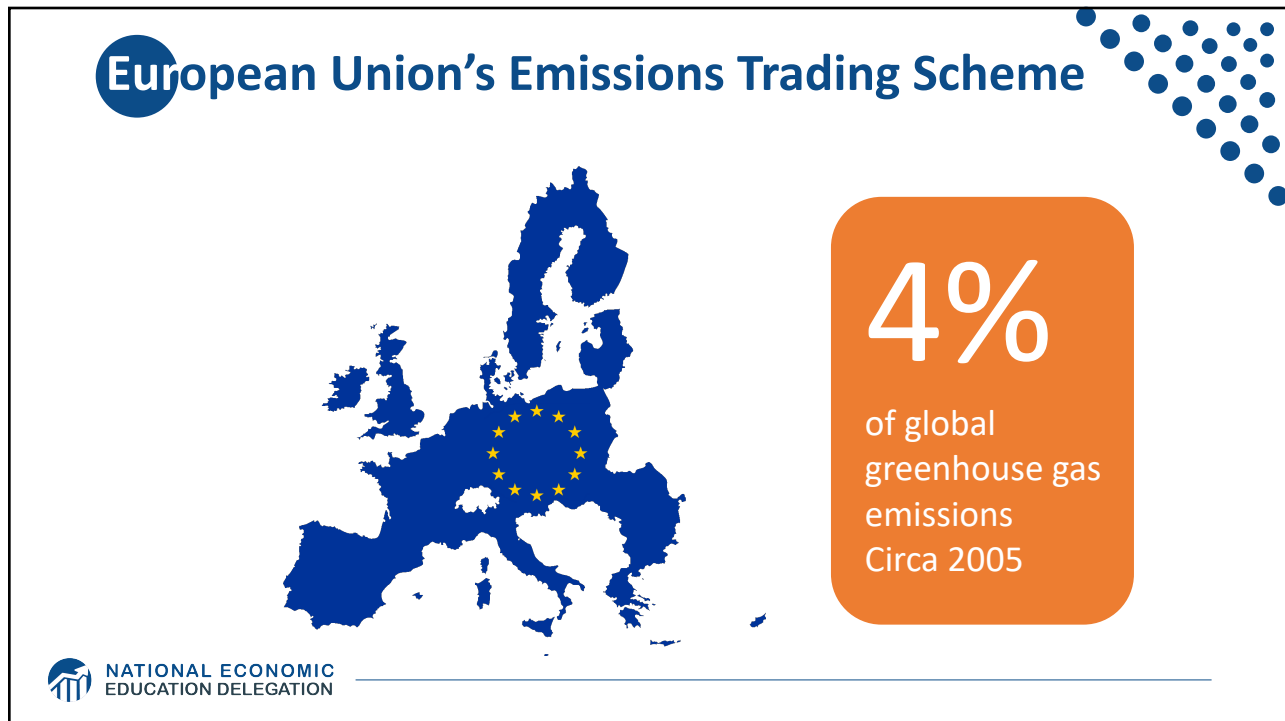


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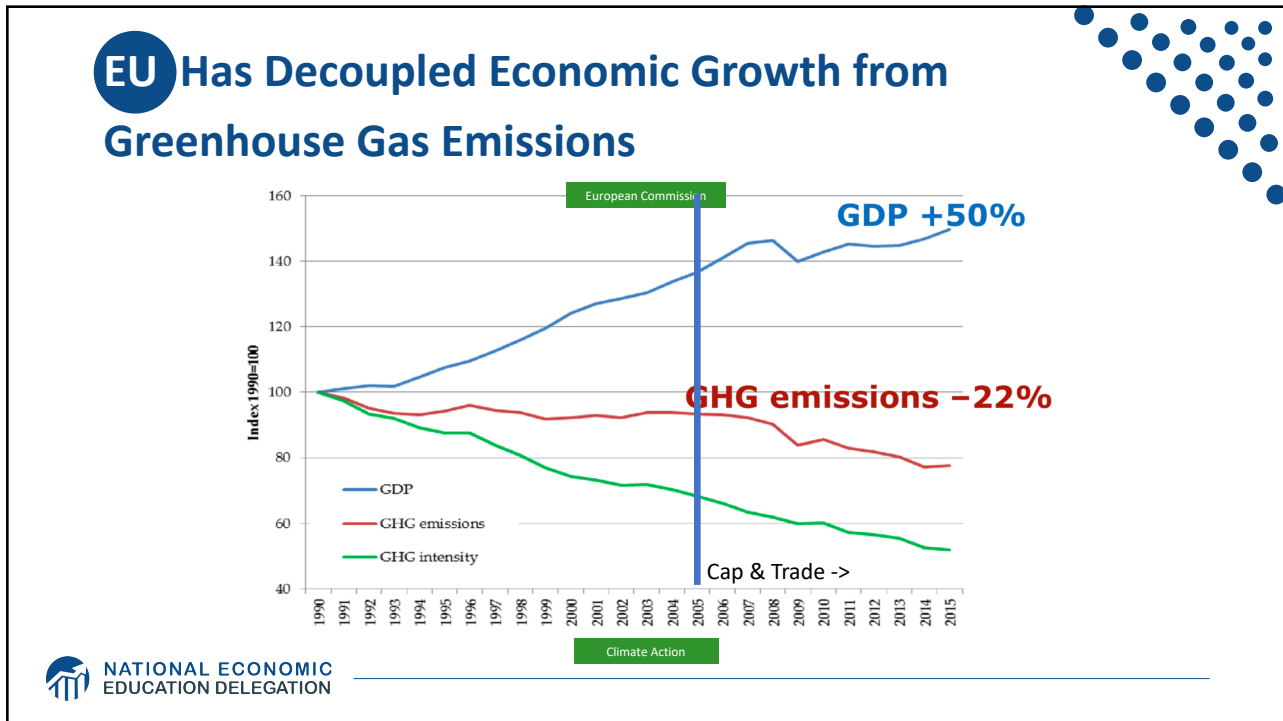
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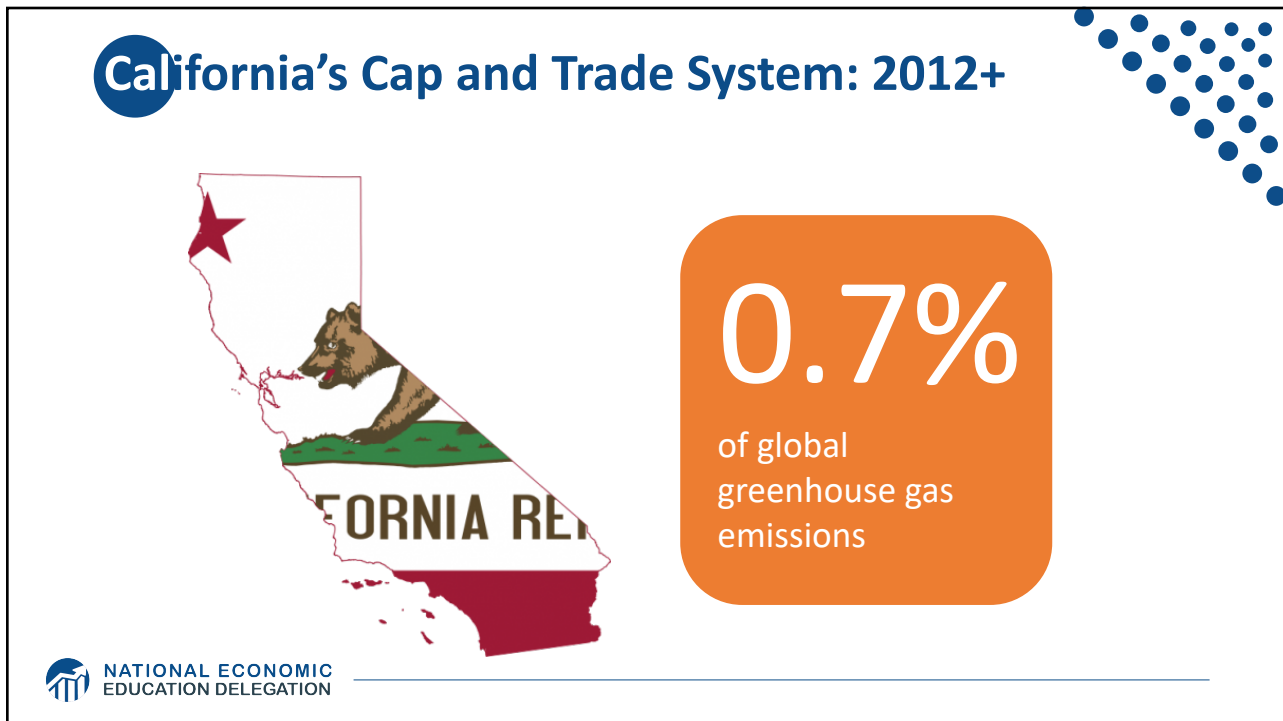
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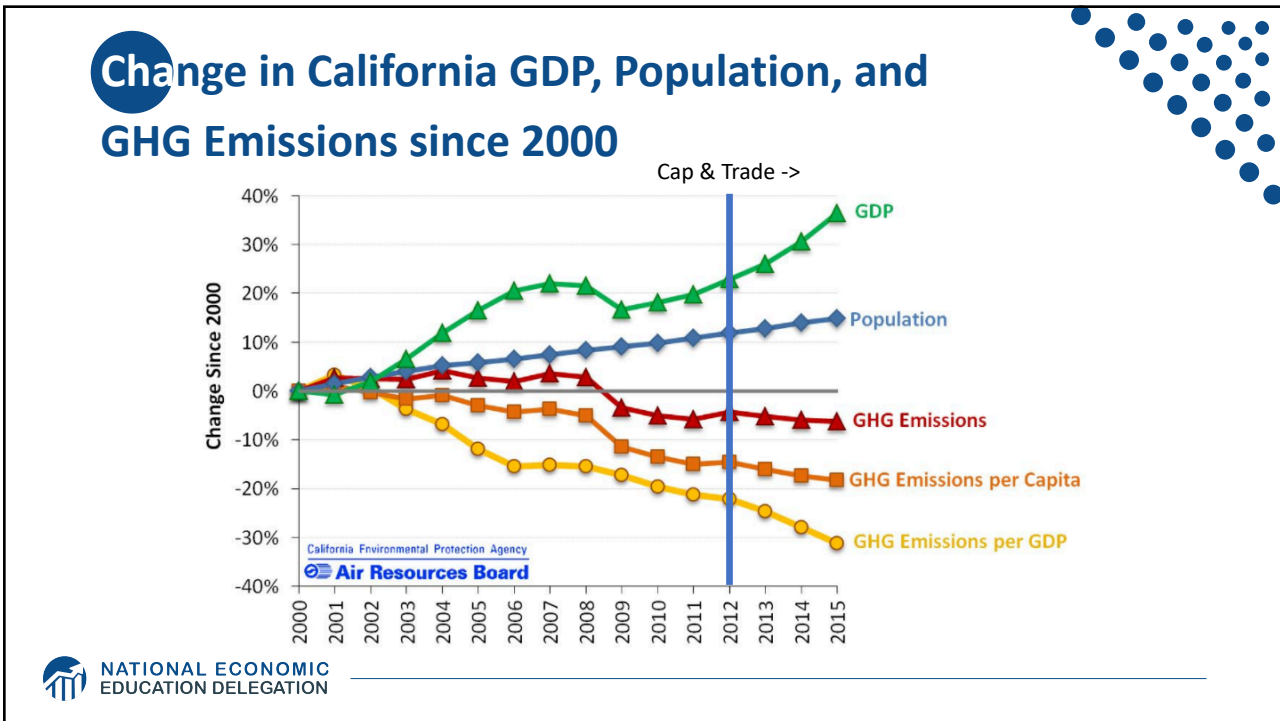
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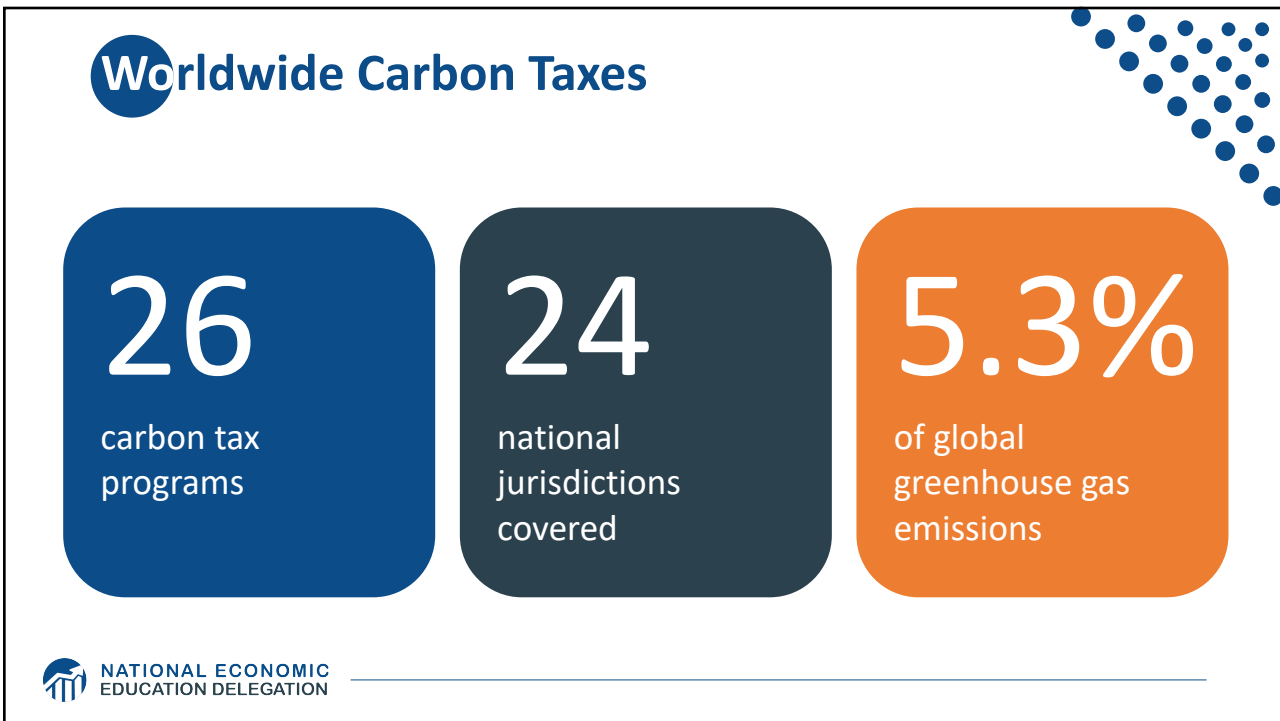
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Sweden's Carbon Tax Policy




**Oldest
Carbon
Tax**




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Sweden's Carbon Tax Policy



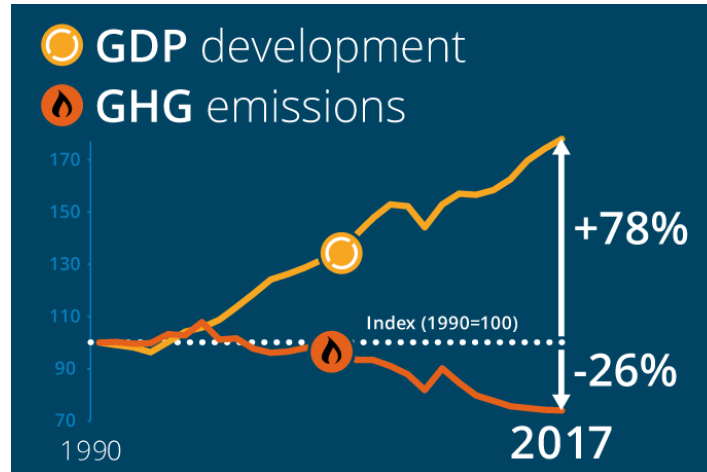
**Started
in 1991**
Currently at \$140/ton



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Real GDP and Domestic CO₂eq Emissions¹ In Sweden, 1990-2017



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Source: Government Offices of Sweden

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Summary

- There are many ways to reduce emissions.
- Economics-inspired policies can help us do this at the lowest cost.
- Taxes and cap and trade are proven effective tools to fight climate change!
- Other tools may also be necessary.
- Goal: implement policies that reach climate goals at the least possible cost.



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Economic Growth and Climate Change Action Are Compatible

- Abating greenhouse gas emissions is costly...
... but climate change damages are even more costly.
- Scientists and the IPCC recommend that we work to keep warming below 1.5 degrees celsius.
 - *Economists believe that this goal is well worth the costs!*
- Economies with environmental regulations can still be dynamic.



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Thank you!

Any Questions?

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