


Climate Change Economics

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Science and Society

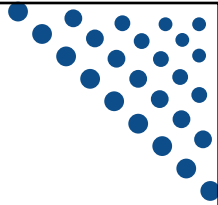
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National Economic Education Delegation

- **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: 53 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: 585+ 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: 45 Ph.D. Economists**

- Aid in slide deck development



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Available NEED Topics Include:

- **US Economy**
- **Economic Inequality**
- **Climate Change**
- **US Social Policy**
- **Trade and Globalization**
- **Economic Mobility**
- **Trade Wars**
- **Housing Policy**
- **Federal Budgets**
- **Federal Debt**
- **Black-White Wealth Gap**
- **Autonomous Vehicles**



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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).



Outline

- **Economics of climate change**
- **Reducing emissions**
- **Climate change policy**
- **Policy in action**



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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Economics of Climate Change

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When Everything Is Simple, No Regulation Is Needed

- Simple transactions: buyer and seller feel all costs and benefits of sales
- → Efficient number of transactions!

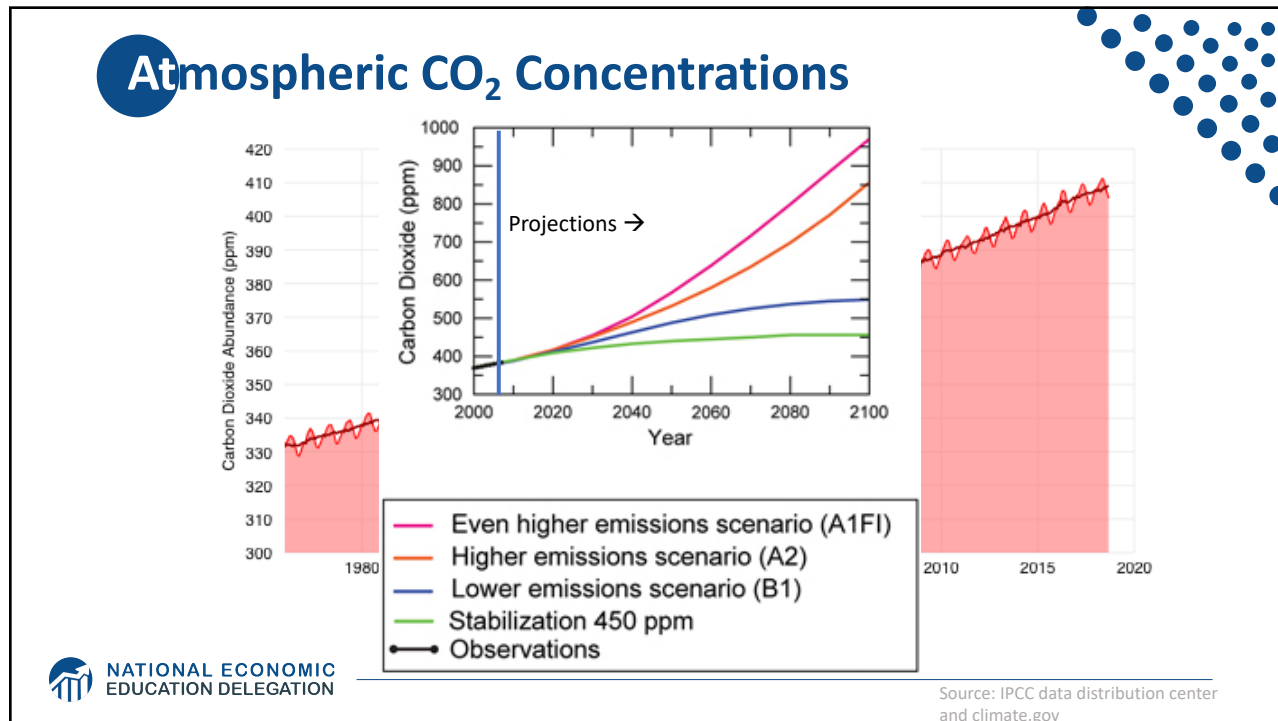
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When Our Decisions Affect Others, We Need Regulation

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



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What Does That Do?

- Increased temperatures
- Altered precipitation patterns
- More variable weather
- More / more powerful storms
- Carbon dissolves in ocean

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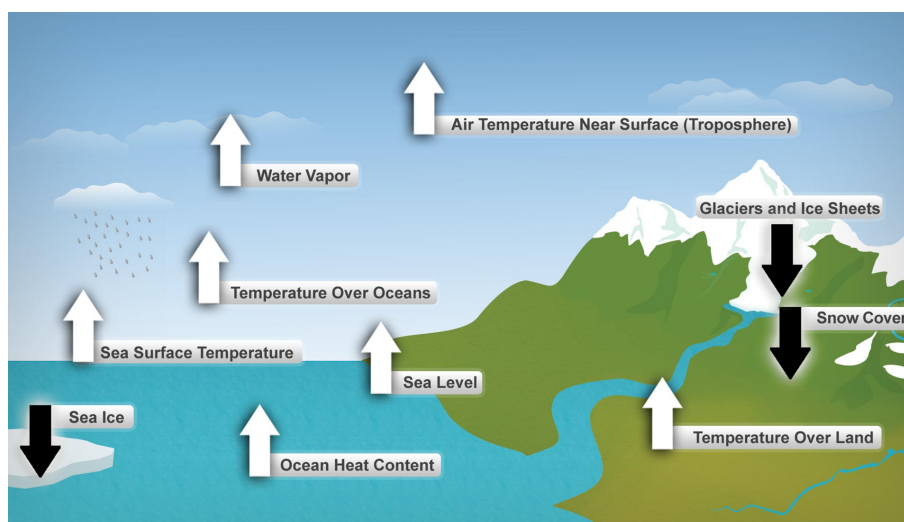
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Global Warming Indicators



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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

A Climate Change Ladder

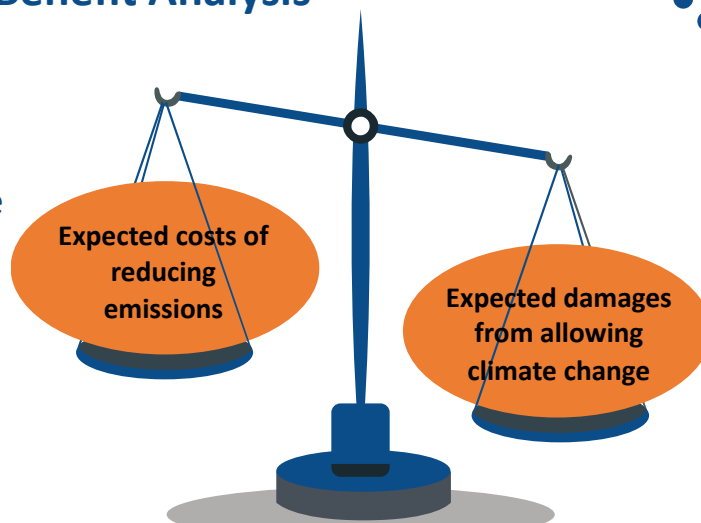
- Emissions
- Mitigation (a.k.a. Abatement)
- Adaptation
- Damages

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.**
 - Costs amount 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

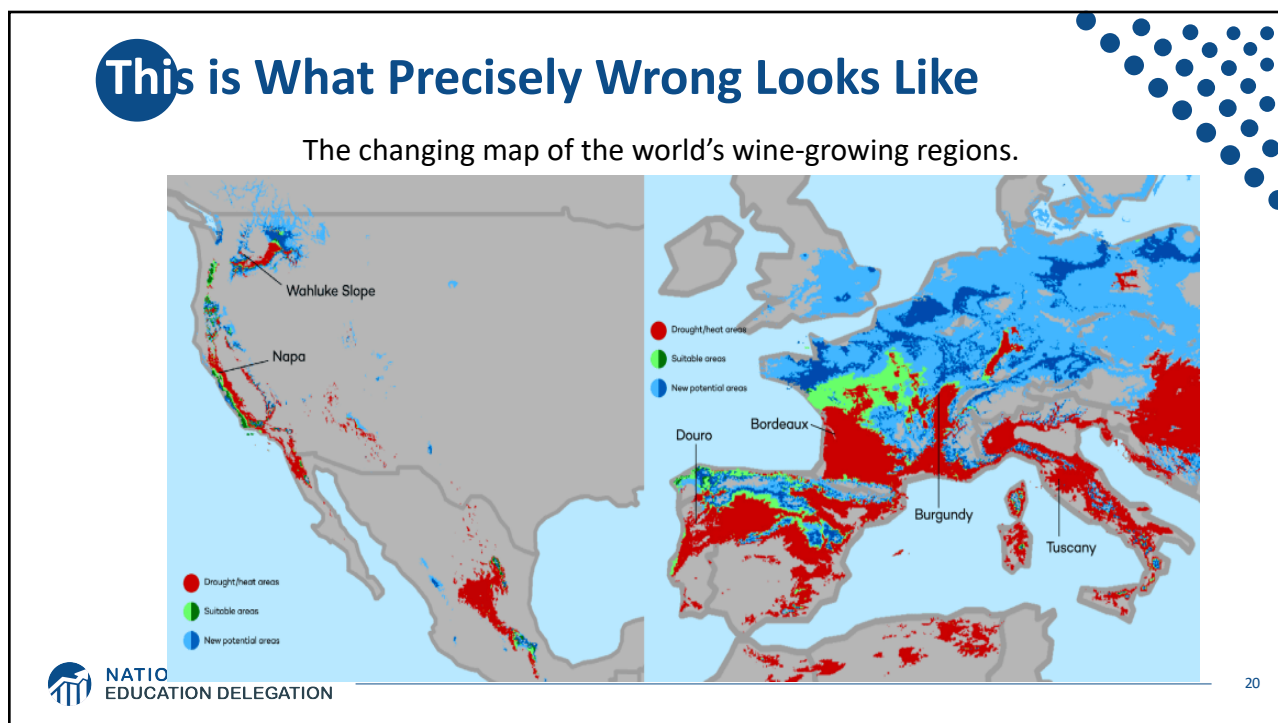


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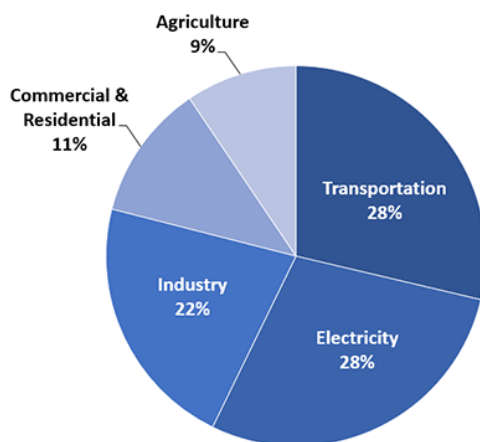
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Reducing Emissions



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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

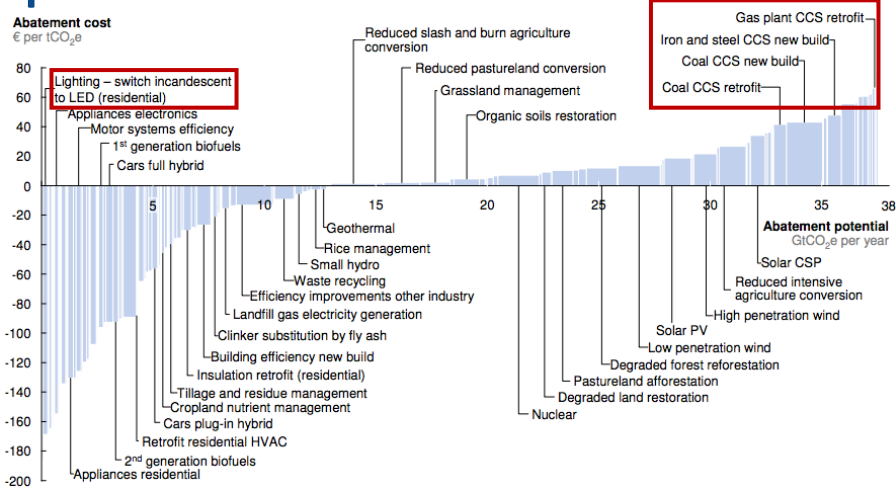


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Global Net Emissions Are What We Care About

- 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 (incl. 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.

Example Global Abatement Cost Curve



Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €80 per tCO₂e 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

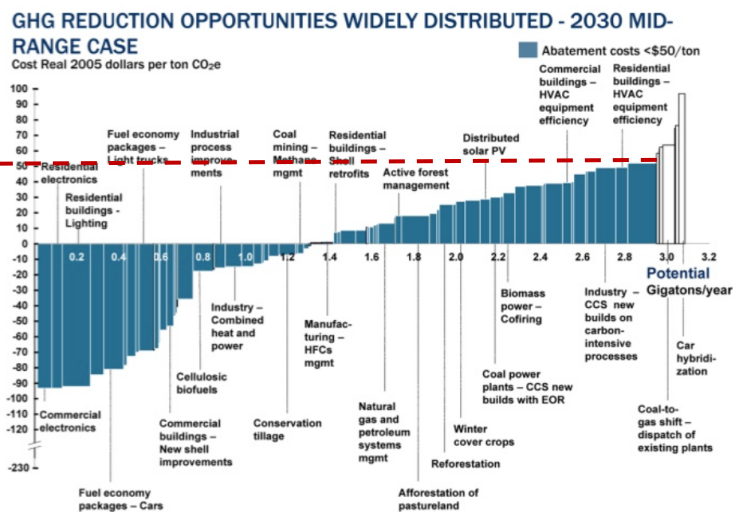
Climate Change Policy

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)
 - Can achieve the same emissions goals at a lower cost!

Putting a Price on Carbon

Suppose a Social Cost
Of Carbon of \$50



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How Does a Carbon Tax Work?

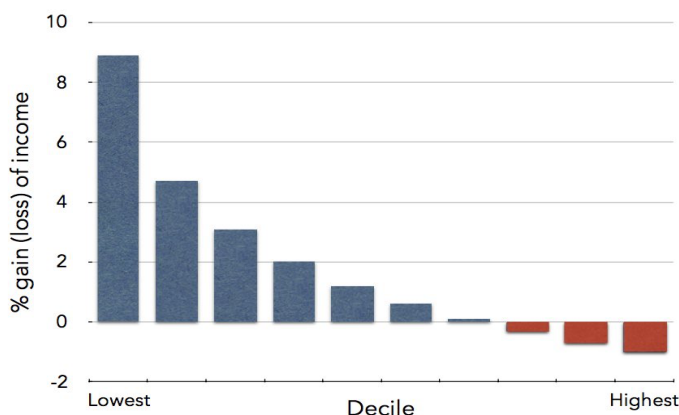
- Choose activities to be covered (e.g., electricity sector, all emitters, etc.).
- Set tax level.
 - Optimally, it represents the social cost of polluting.
- Polluters must pay a tax for every unit emitted.
 - Polluters with **low** abatement costs will **abate** to avoid the tax.
 - Polluters with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

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Revenue Dividend Eliminates Regressivity

IMPACT OF CARBON DIVIDENDS ON U.S. FAMILY INCOMES



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Source: U.S. Treasury, 2017

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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**.




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Carbon Tax and Cap & Trade: the Differences


	Carbon Tax	Cap & Trade

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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	1) Always generates revenue 2) May require legislation to change 3) Predictability	1) Susceptible to lobbying. 2) Only generates revenue if government sells permits. 3) Cap can be changed by regulator. 4) Less certainty over future. 5) Regulations reduce efficacy of Cap & Trade

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That Last Thing: Cap and Trade vs. Carbon Tax

- **Emissions regulations and Cap and Trade can work at cross purposes.**
 - Regulations that lower emissions from big polluters...
 - Lowers the demand for permits.
 - Lowers the price of permits.
 - *Reduces incentives for other industries to cut emissions.*
- **Regulations can undermine the effectiveness of Cap and Trade.**
- **The same is not true of a carbon tax.**
 - Though regulations might cut tax revenue, revenue is not the goal of the carbon tax.



Thoughts on Regulation vs Market-Oriented

- **Equity.**
 - Both types of policies are regressive.
 - Cap and Trade and a Carbon Tax can offset the regressivity.
 - 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?



Efficiency: CAFÉ vs Carbon Tax

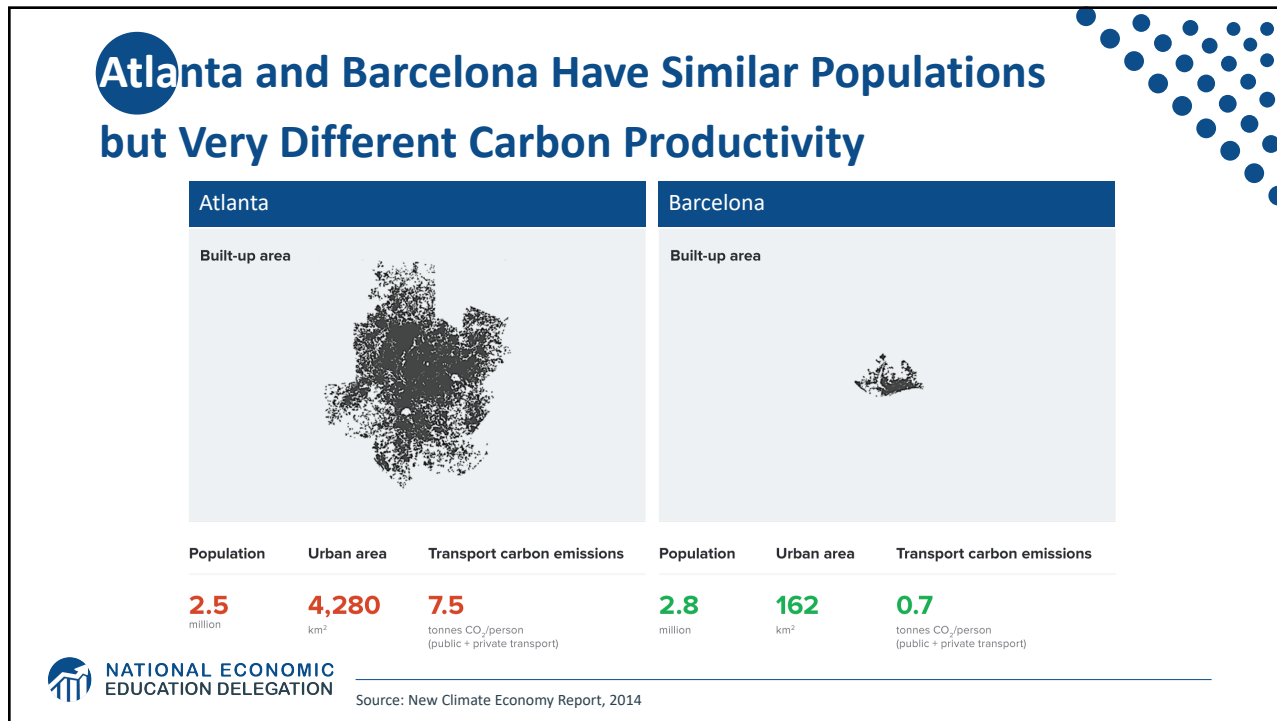
- **CAFÉ = Corporate Average Fuel Efficiency**
 - A fuel economy standard mandating that an auto-maker's vehicle fleet must meet minimum fuel economy standards.
- **Horse Race**
 - Tax on fuel applies to ALL vehicles, not just new.
 - Rebound Effect:
 - Driving a more efficient vehicle lowers the cost per mile driven
 - leading to more miles driven.
 - Slower turnover of inefficient vehicles: higher cost of new.
- **Summary**
 - A given level of emission reductions **costs 3-14 times more with CAFÉ** standards than under a comparable carbon tax.



Examples of Other Policies that Reduce Emissions

- **R&D 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**

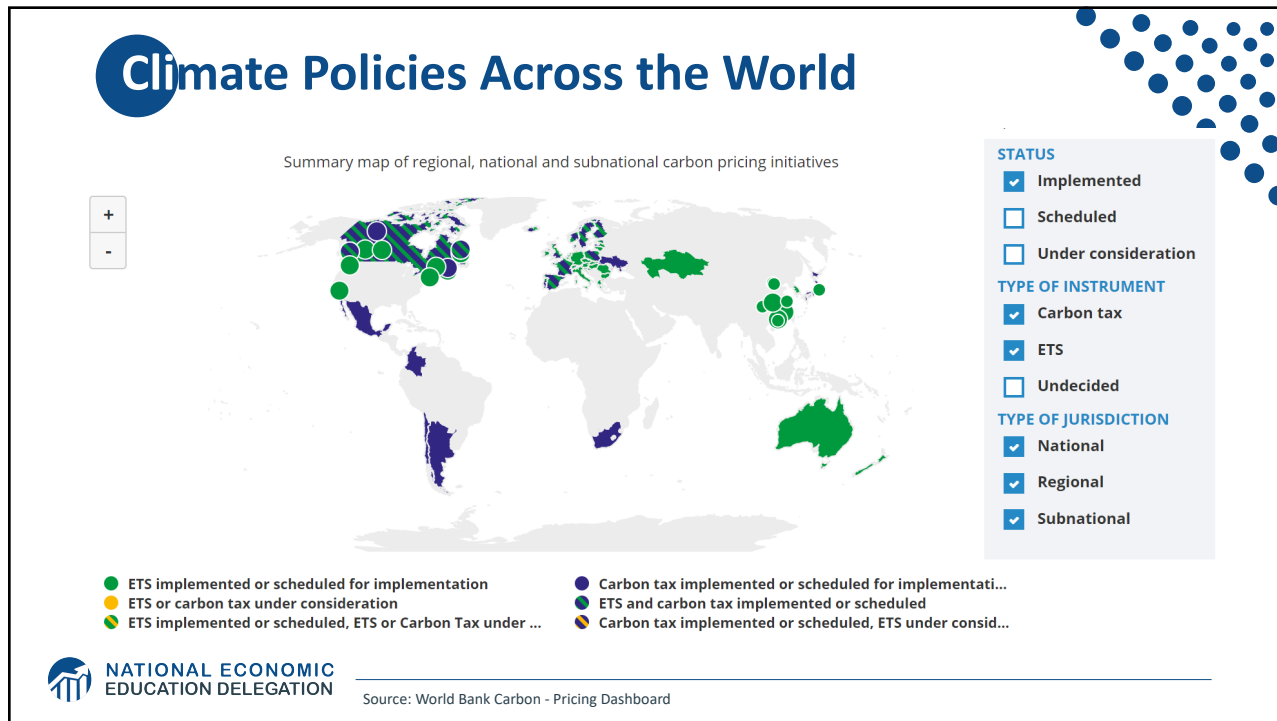




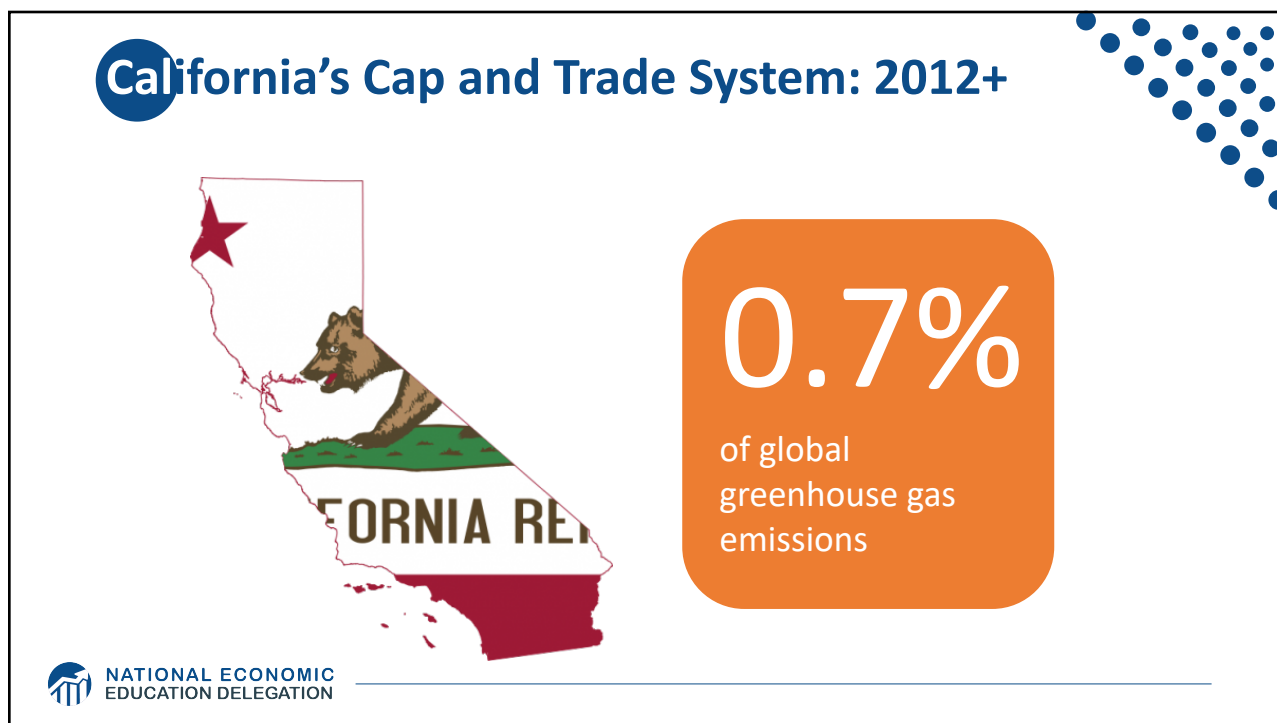
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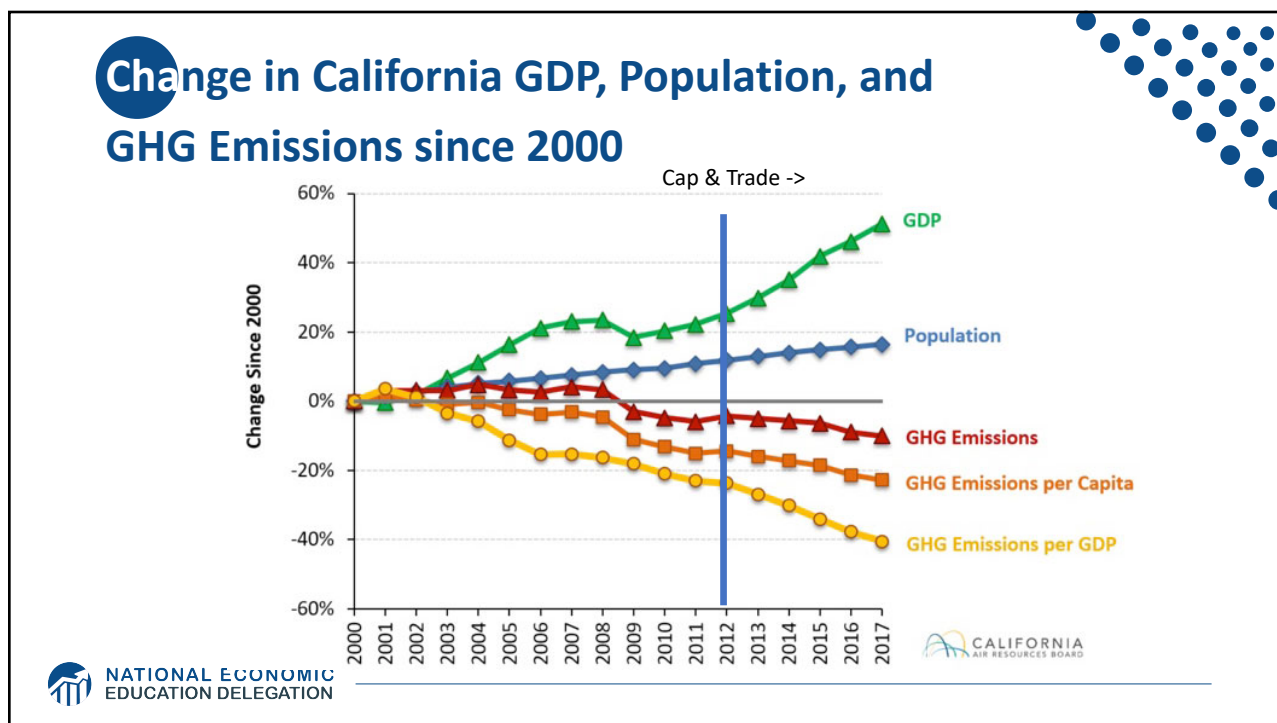
California's AB32: Global Warming Solutions



- **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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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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Thank you!

Any Questions?

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