

Climate Change Economics

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Executive Director, NEED

ExtraFood, Board Meeting
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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.
- **ARE COMPLETELY FREE!**

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: 361 members**

- At all levels of academia and some in government service
- Crowdsource slide decks
- Give presentations

- **Global Partners: 42**

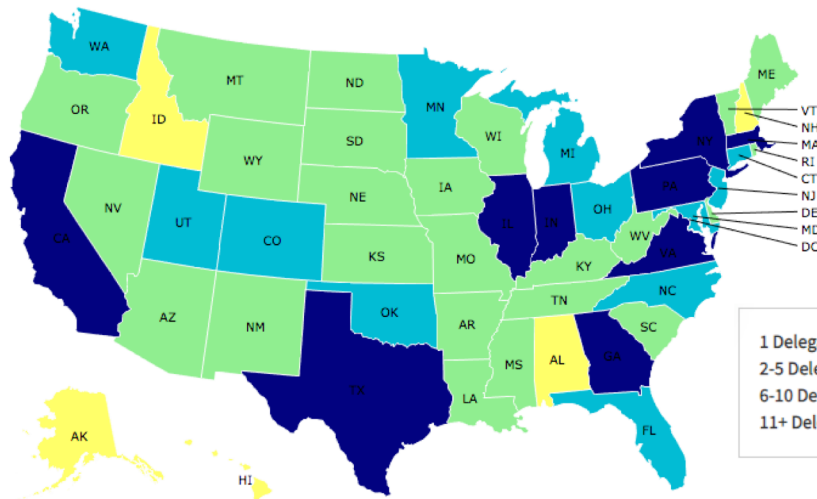
- Aid in slide deck development



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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).



Outline

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



How Can Economists Contribute to Thinking about Climate Change?

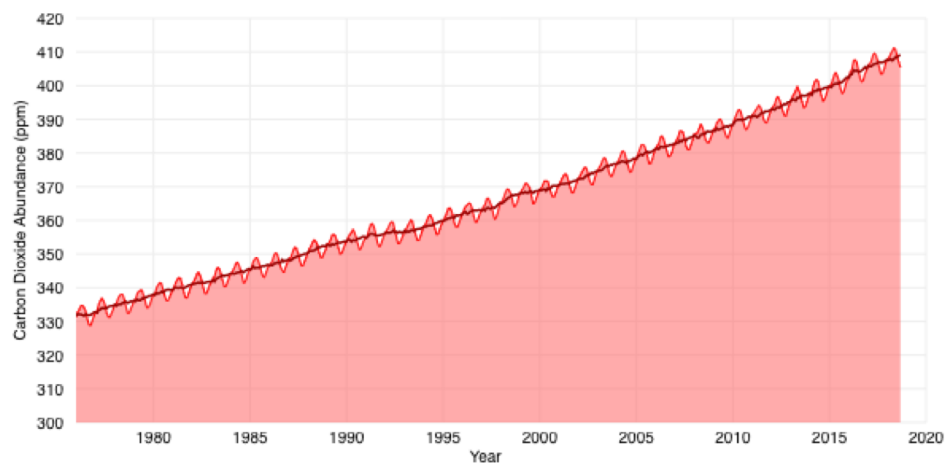
- By assessing behavioral reactions to climate change.
- By measuring the damage and estimating the economic costs of fighting climate change.
- By designing smart policies that minimize costs.
 - Balance economic growth with GHG emission mitigation.



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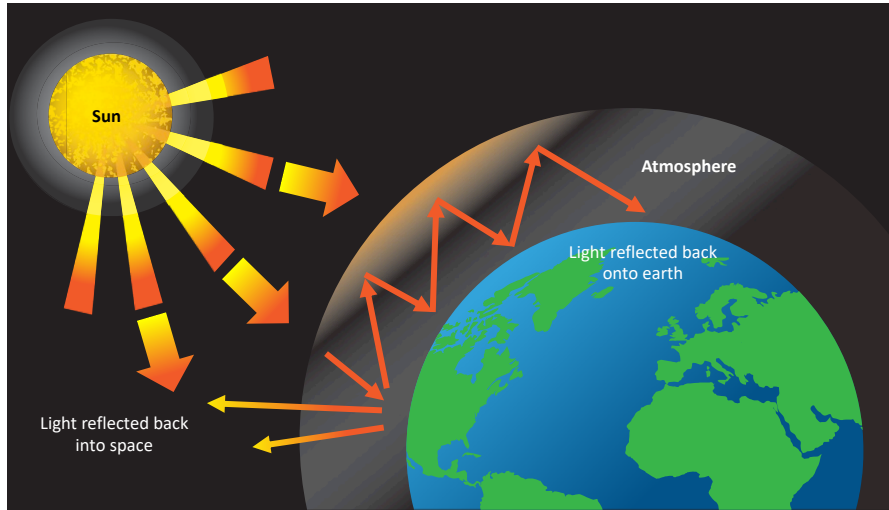
Atmospheric CO₂ Concentrations



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Source: IPCC data distribution center
and climate.gov

The Atmospheric Greenhouse Effect



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Uncertainty



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Pollution Economics

- **Human activity creates pollution.**
 - The goal is not zero pollution but society's best balance between pollution and human benefits.
- **Pollution is an EXTERNALITY: a side effect (cost or benefit) that affects someone else when something is bought or sold.**
 - The power company sells you electricity for your house, but the pollution from the power plant affects everyone, not just you!
 - This is a *market failure*.
- **All of the effects are not always felt by the buyers and sellers.**
 - The price of electricity does not reflect all of the costs—there is too much pollution.
 - Electricity is too cheap. The balance is wrong.



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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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Adaptation Reduces Damages

- Human *adaptations* are costly actions that can reduce damages from climate change.
- People will take some actions on their own.
 - So long as they find it worthwhile.
- Some responses require government involvement:
 - large-scale actions or actions with shared benefits.
- Some existing policies deter market based adaptation.
 - E.g., overly generous flood insurance, trade barriers, immigration policy
- Adaptation is already underway.



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Individual-Level Adaptation Examples

- **Do you behave differently on a hot day?**

- Staying inside more often.
- Turn on the air conditioning.
- Think about moving.



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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**

- **Supporting low-income and vulnerable populations**

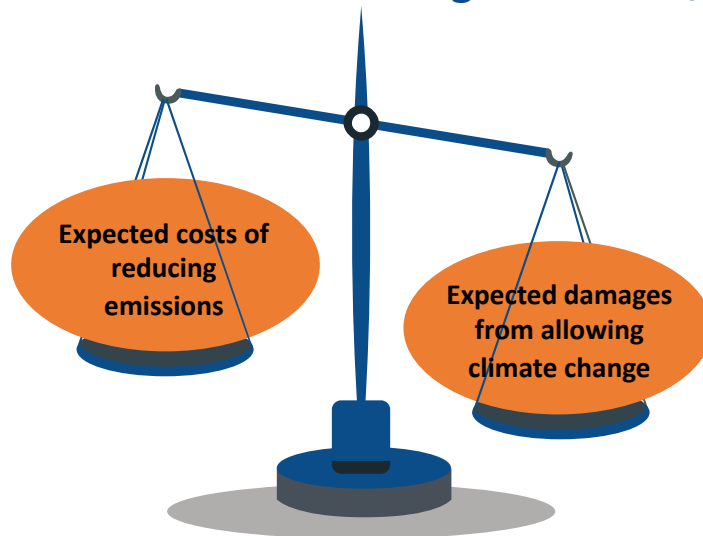
- **Moving residents of a town**



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How Economists Decide How Much to Fight Climate Change

- Cost Benefit Analysis
- Weigh:



Cost-Benefit Analysis of Fighting Climate Change

- **Costs of Climate Change:**
 - Stern Report estimate: damages could be as high as **20% of worldwide GDP**.
- **Costs 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 are almost certainly less than the economic damages avoided.**



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

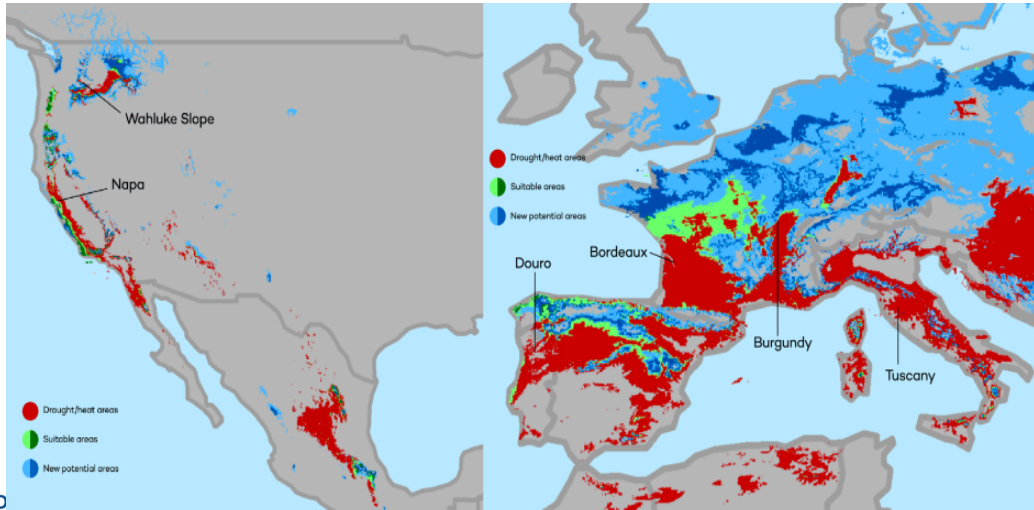
- Increased violence

- Some of these may cause human migration and/or conflict

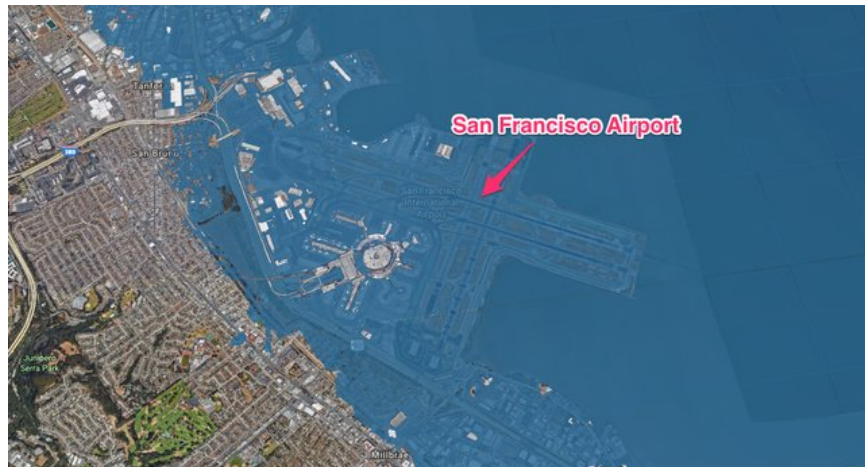


This is What Precisely Wrong Looks Like

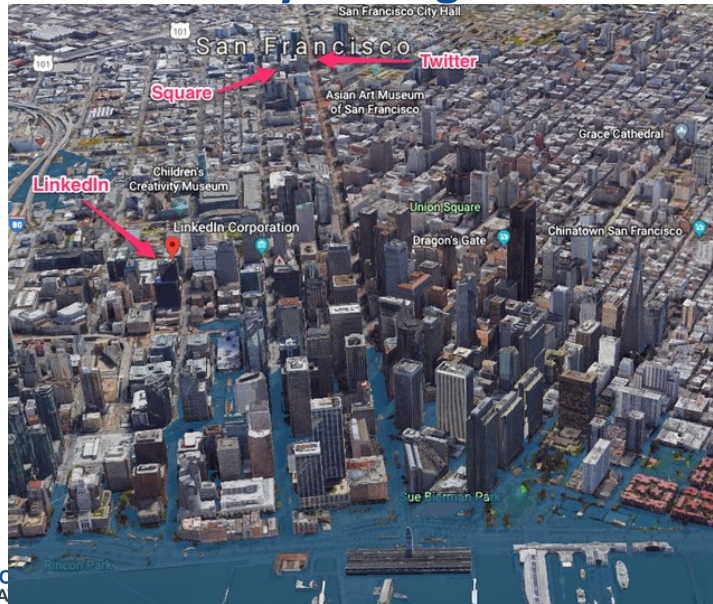
The changing map of the world's wine-growing regions.



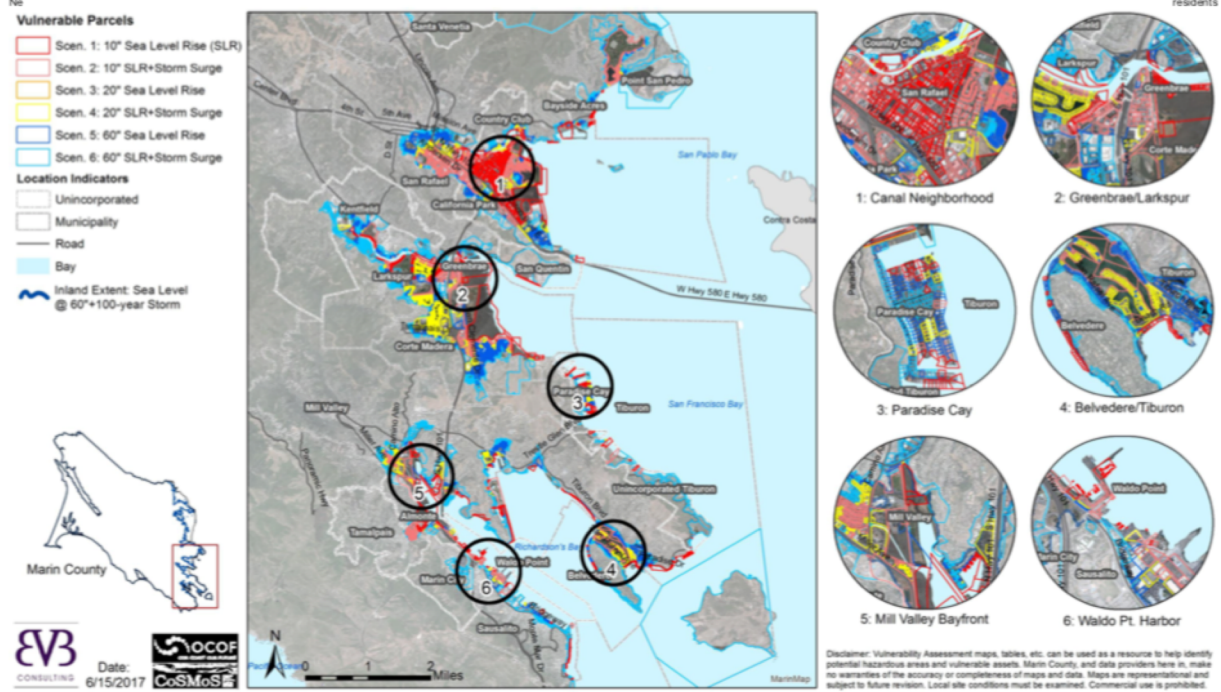
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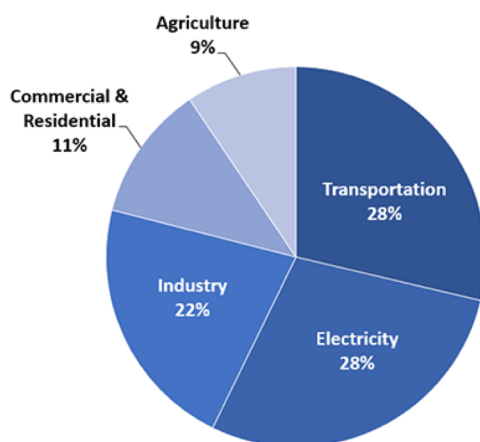
Map 11. Southern Study Area Parcels Vulnerable to Sea Level Rise and a 100-year Storm Surge



Addressing the Sources of Our Emissions



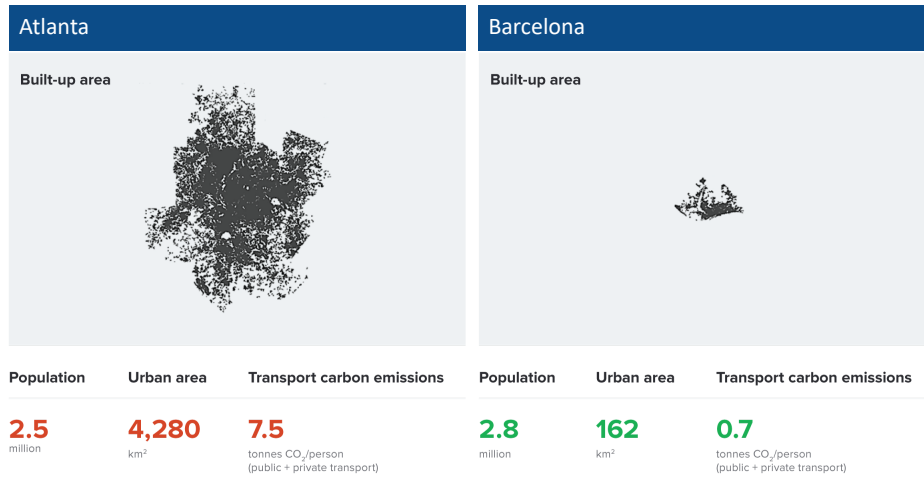
Total U.S. Greenhouse Gas Emissions by Economic Sector in 2016



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



Atlanta and Barcelona Have Similar Populations but Very Different Carbon Productivity



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Source: New Climate Economy Report, 2014

Challenges with Renewable Energy

- It's intermittent - only produced if there is sun or wind.
- Energy is needed all day and night, with peak times.
- Limited w/o storage.
 - Creative storage options are under development



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Climate Change Policy



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Policies That Reduce Emissions

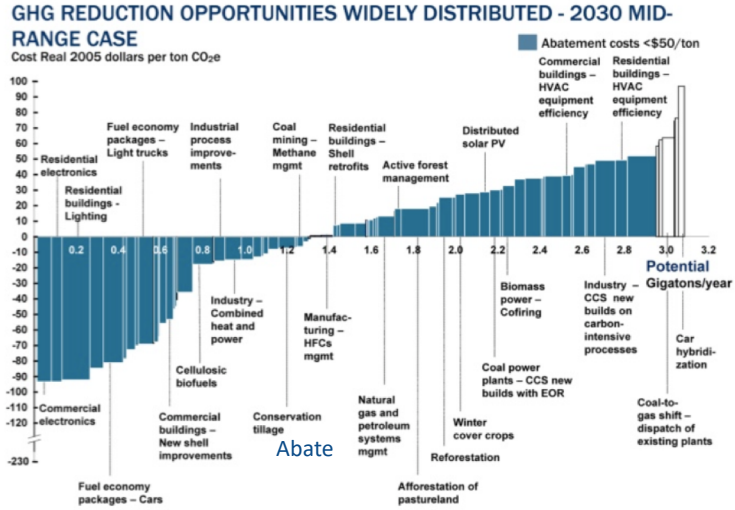
- **Indirect policies**
 - Subsidizing R&D
 - Land use policies
 - Energy efficiency mandates and subsidies
 - Mandating renewable energy (e.g., renewable portfolio standards)
- **Regulation**
 - Emissions standards or limits
- **Market oriented policies**
 - Putting a price on emissions
 - o Subsidizing green energy (e.g., feed-in tariffs)
 - o Tax or cap & trade
- **Goal: design policies that reach climate goals at the least possible cost.**



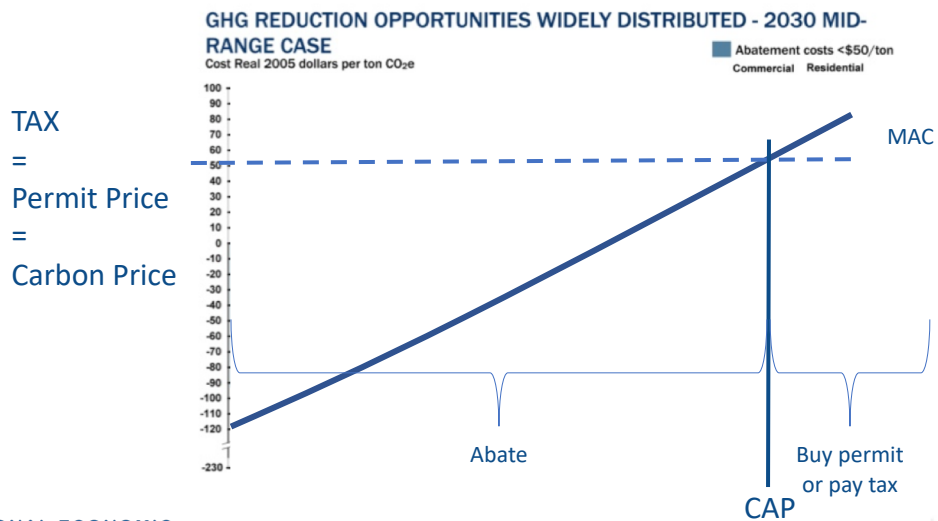
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32

Putting a Price on Carbon – Abatement Costs



Putting a Price on Carbon – Abatement Costs



Carbon Prices: the Good and Bad

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



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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	Always generates revenue May require legislation to change	May be more susceptible to lobbying Only generates revenue if government sells permits Cap can be changed by regulator



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Climate Change Policy in Action



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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.
- Economic growth comes with consequences that we have to deal with, including climate consequences.
- Economies with environmental regulations can still be dynamic.



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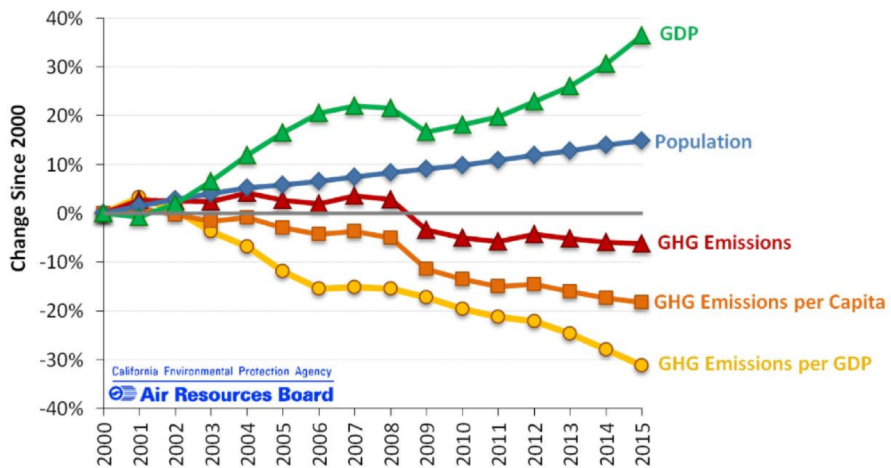
California's Cap and Trade System



0.7%
of global
greenhouse gas
emissions

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Change in California GDP, Population, and GHG Emissions since 2000



California Environmental Protection Agency
Air Resources Board

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Carbon Tax

A diagram illustrating the mechanism of a carbon tax. At the top, a large blue cloud contains the text "CO₂". Below this cloud is an orange rectangular box with the text "CARBON TAXES" in white. Three orange arrows point downwards from the "CARBON TAXES" box to a smaller blue cloud at the bottom containing the text "CO₂".

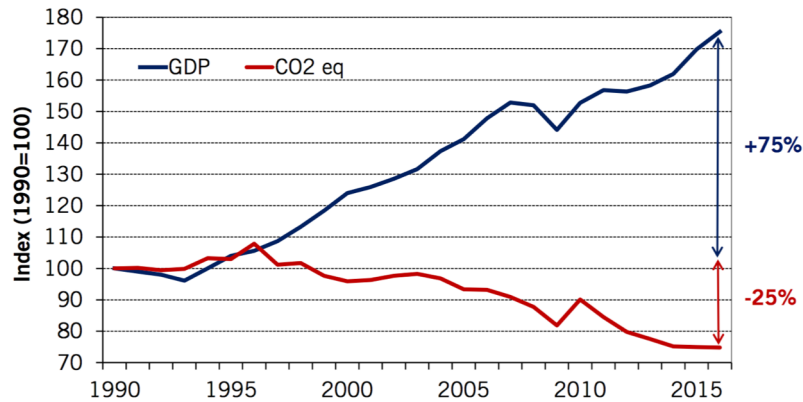
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Sweden's Carbon Tax Policy

A map of Sweden is shown on the left, colored in blue and yellow to represent the Swedish flag. To the right of the map is a large orange rounded rectangle containing the text "Started in 1991" in white. Below this text, in a smaller font, it says "Currently at \$140/ton".

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Real GDP and Domestic CO₂eq Emissions¹ In Sweden, 1990-2016



¹ In accordance with Sweden's National Inventory Report, submitted under the UNFCCC and the Kyoto Protocol. CO₂ = approx. 80 % of total CO₂eq emissions. Preliminary data for 2016.

Sources: Swedish Environmental Protection Agency, Statistics Sweden



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Summary: Seriously Consider Carbon Pricing

- 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!
- Relying on adaptation imposes a cost on individuals that results from the activities of society

- This is particularly true in the Bay Area



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U.S. Carbon Tax Plans

- Climate Leadership Council
- Citizens Climate Lobby
- States and municipalities:
Washington state, Oregon,
Washington, DC



Thank you!

Any Questions?

www.NEEDelegation.org

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Contact NEED: Info@NEEDelegation.org

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