

Climate Change Economics

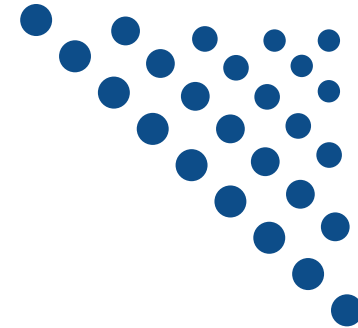
Jon Haveman, Ph.D.

Novato Public Library

April 30, 2019



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.

Who Are We?

- **Honorary Board: 44 members**

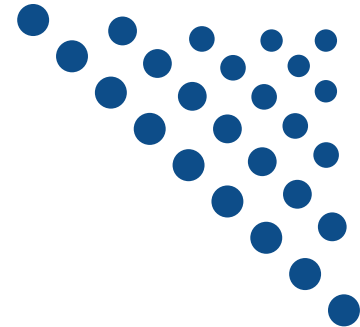
- 2 Fed Chairs: Janet Yellen, Ben Bernanke
- 6 Chairs Council of Economic Advisers
 - Furman (D), Rosen (R), Bernanke (R), Yellen (D), Tyson (D), Goolsbee (D)
- 3 Nobel Prize Winners
 - Akerlof, Smith, Maskin

- **Delegates: 364 members**

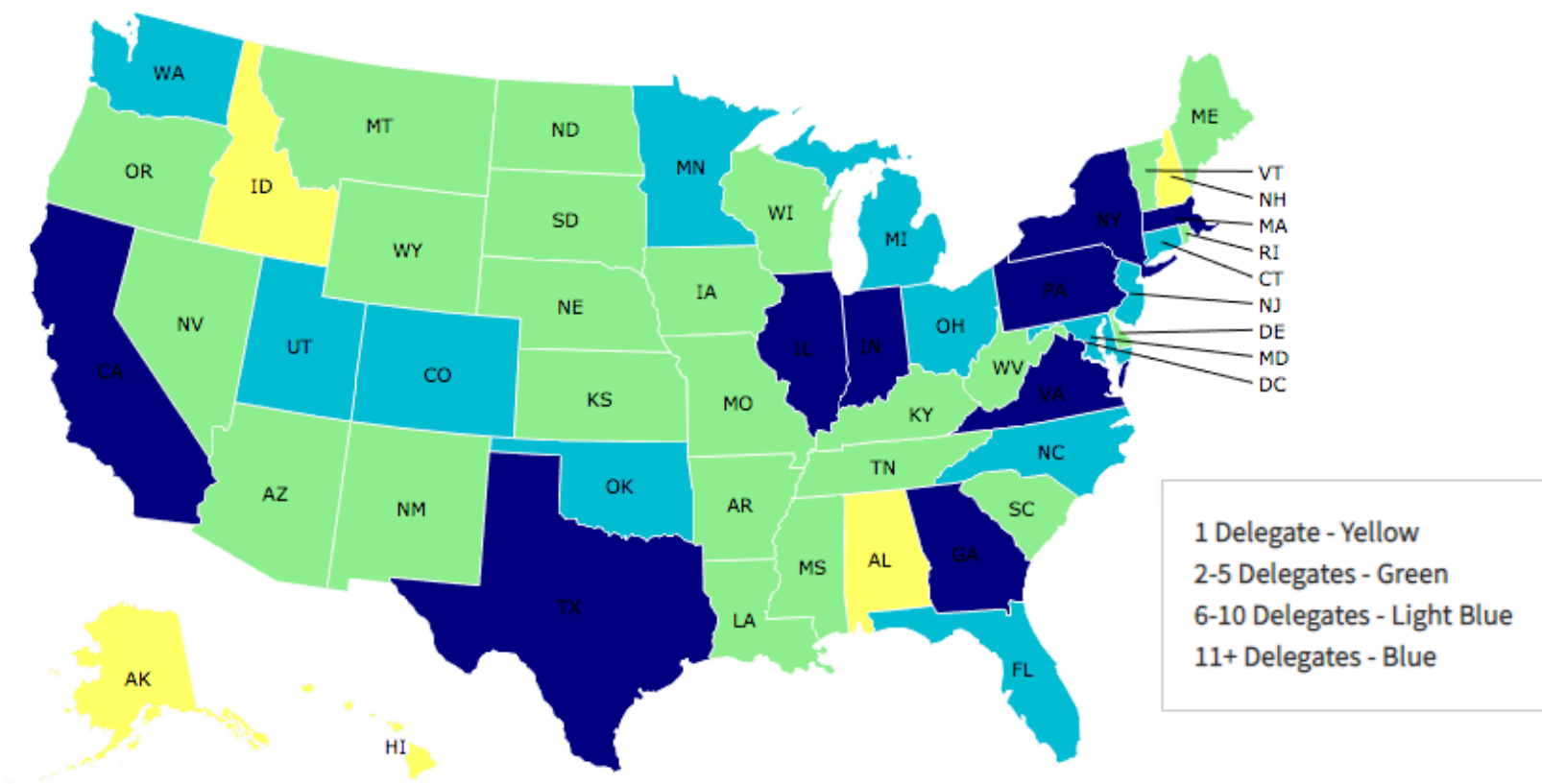
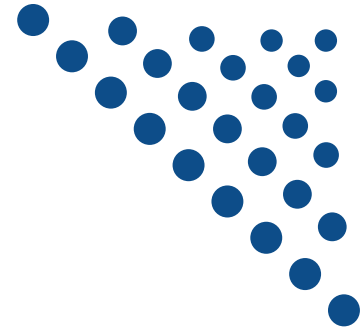
- At all levels of academia and some in government service
- All have a Ph.D. in economics
- Crowdsourc slide decks
- Give presentations

- **Global Partners: 42 Ph.D. Economists**

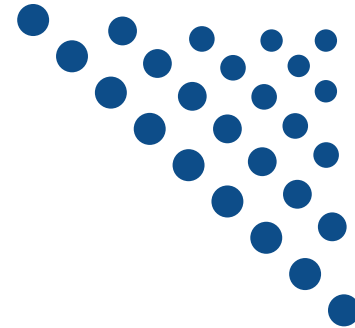
- Aid in slide deck development



Where Are We?

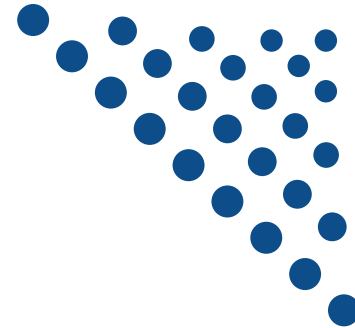


Credits and Disclaimer



- **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**
- **Impacts of climate change**
- **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.

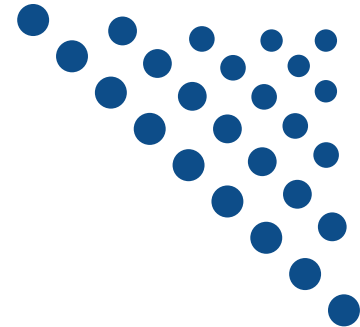
Pollution Imposes Costs Outside the Market

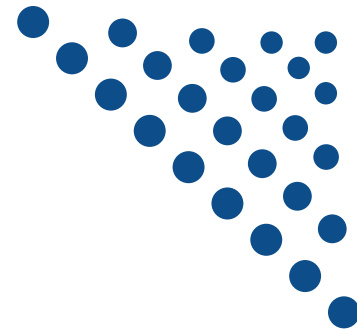
- **Pollution is an EXTERNALITY: a side effect (cost or benefit) that affects someone else when something is bought or sold.**
 - The power company sells you electricity for your house, but the pollution from the power plant affects everyone, not just you!
 - This is a *market failure*.
- **All of the 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. Too much will be produced.
- **There is a cost of electricity above the price paid.**



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.





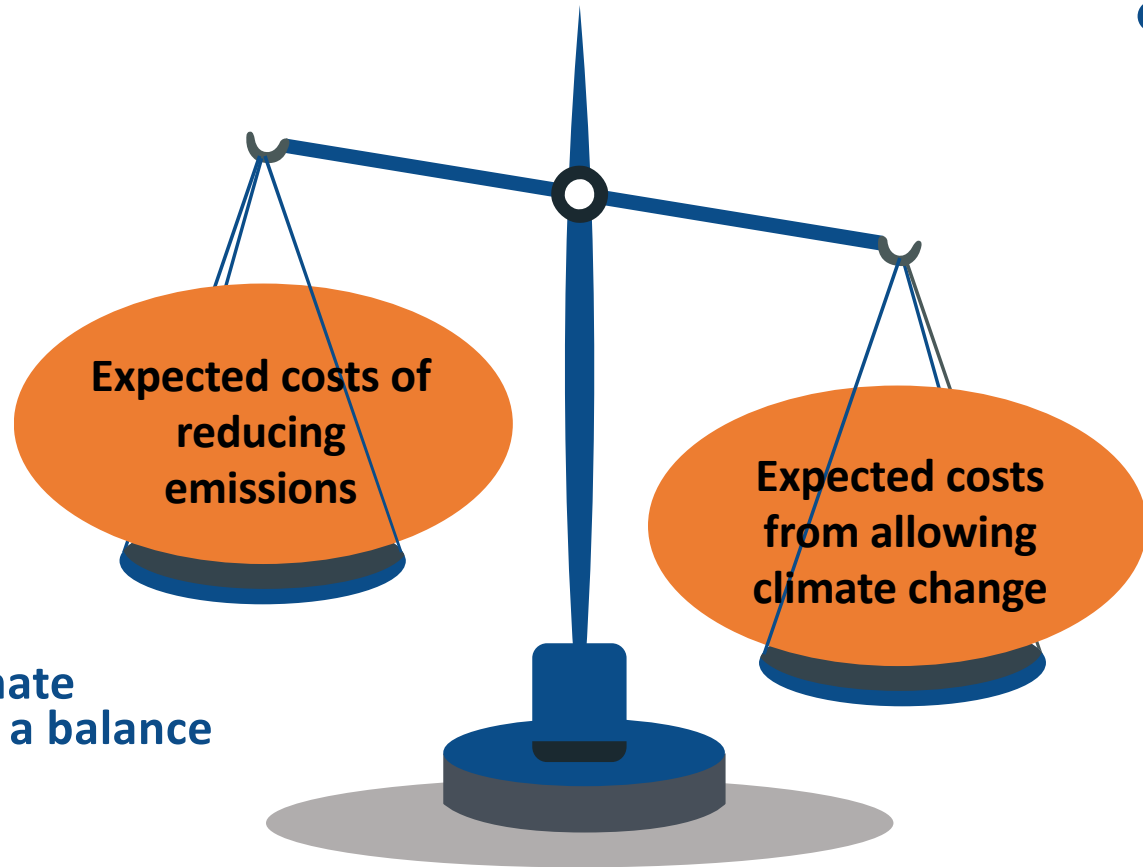
Economics of Responding to Climate Change



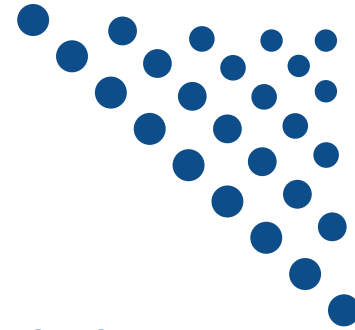
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How Economists Decide How Much to Fight Climate Change

- **Cost Benefit Analysis**
- **Weigh:**
- **This does not likely eliminate emissions, but recognizes a balance between economic costs.**



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.
 - Stern Report estimate: damages could be as high as **20% of worldwide GDP**.
- **Caveats:**
 - Putting a monetary value on priceless things
 - Inequality
 - Uncertainty and risk

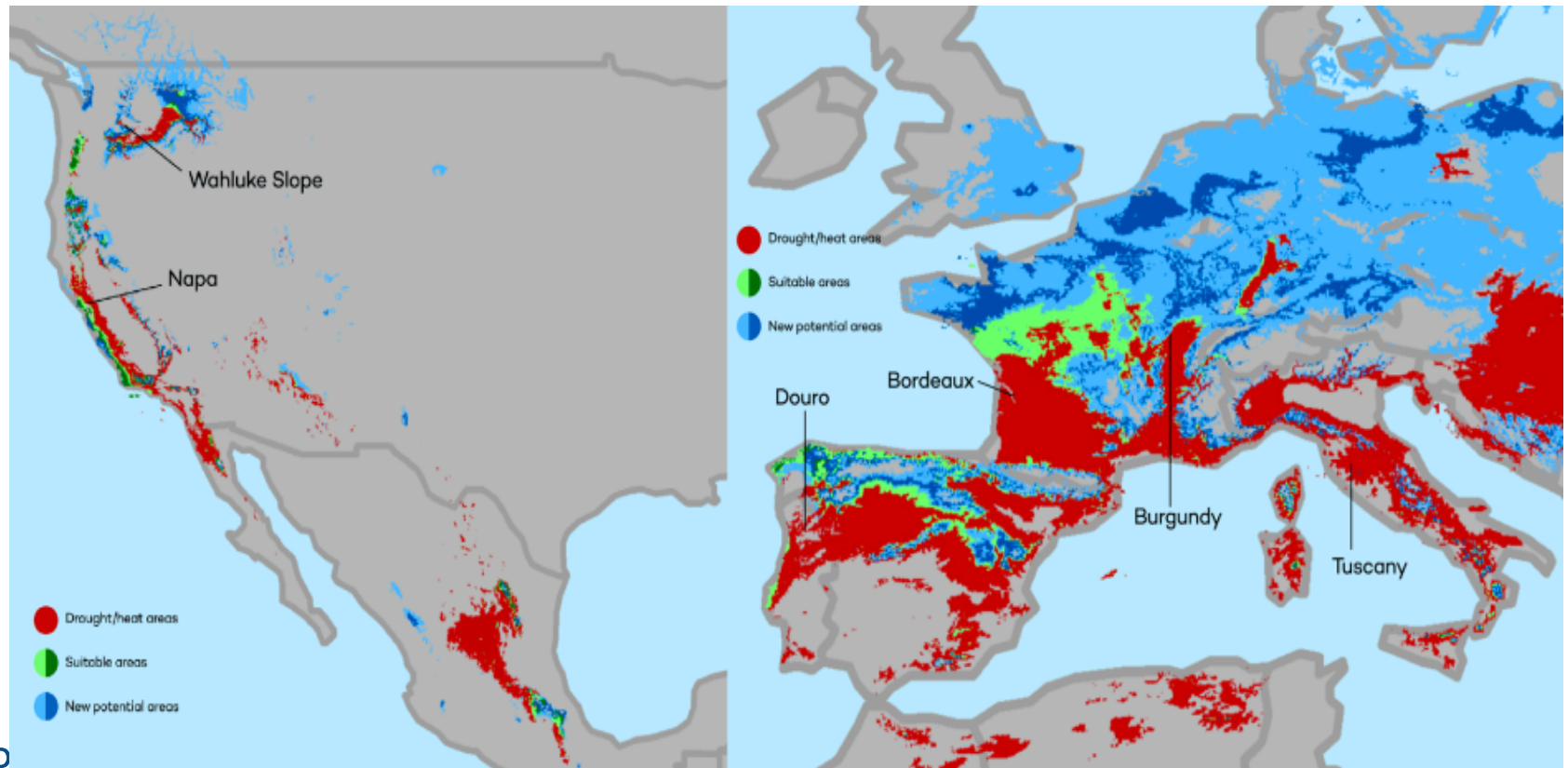


**“It is better to be roughly right
than precisely wrong.”**

- John Maynard Keynes

This is What Precisely Wrong Looks Like

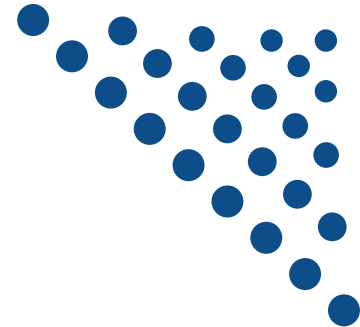
The changing map of the world's wine-growing regions.



This is What Precisely Wrong Looks Like

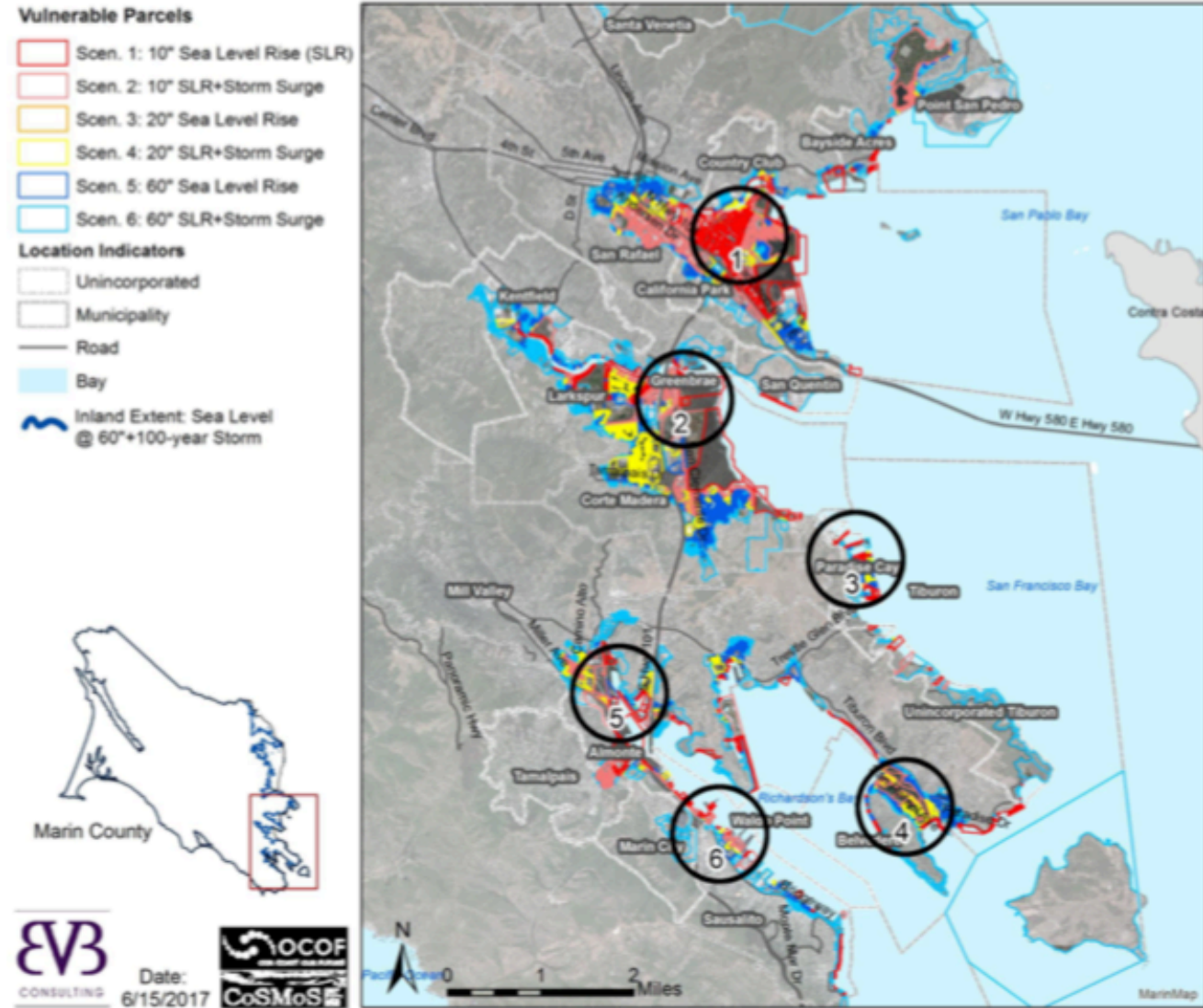


This is What Precisely Wrong Looks Like

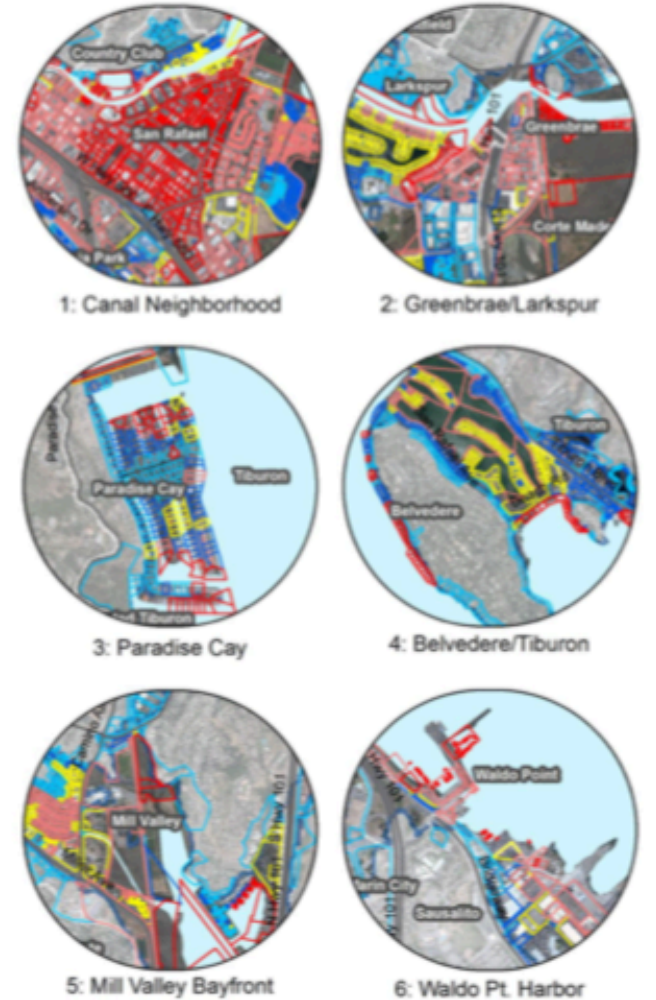


Map 11. Southern Study Area Parcels Vulnerable to Sea Level Rise and a 100-year Storm Surge

Ne

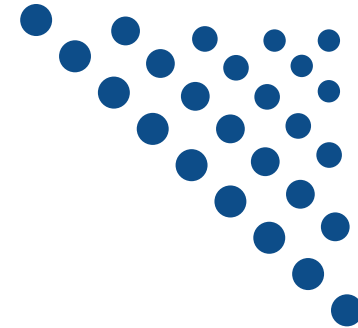


residents



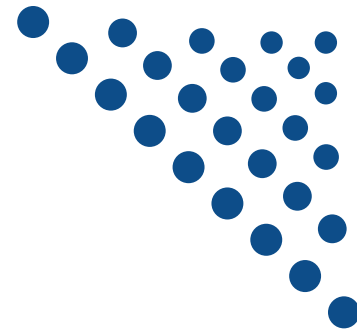
Disclaimer: Vulnerability Assessment maps, tables, etc. can be used as a resource to help identify potential hazardous areas and vulnerable assets. Marin County, and data providers here in, make no warranties of the accuracy or completeness of maps and data. Maps are representational and subject to future revision. Local site conditions must be examined. Commercial use is prohibited.

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.**
- **Goal: design policies that reach climate goals at the least possible cost.**

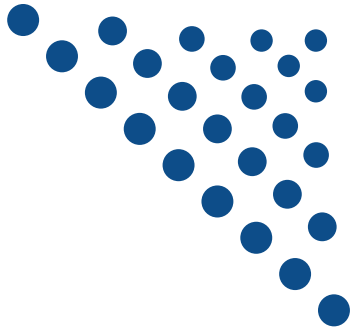




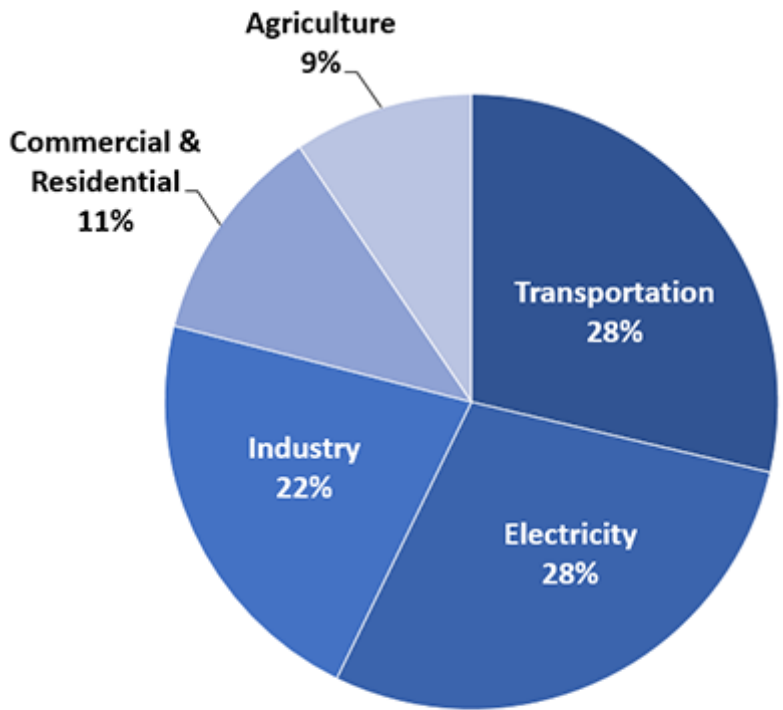
Addressing the Sources of Our Emissions



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

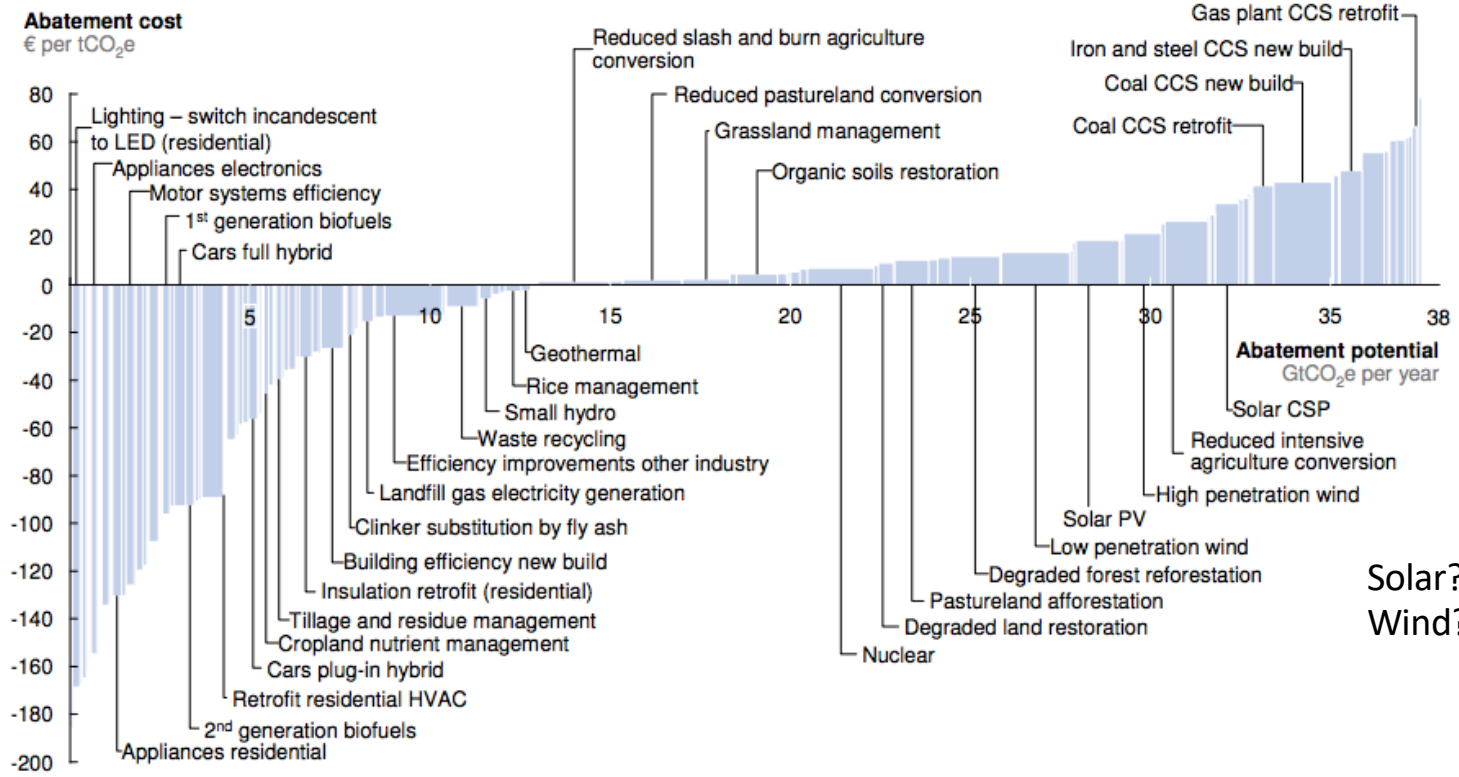


U.S. Environmental Protection Agency (2018). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016

Global GHG Abatement Cost Curve

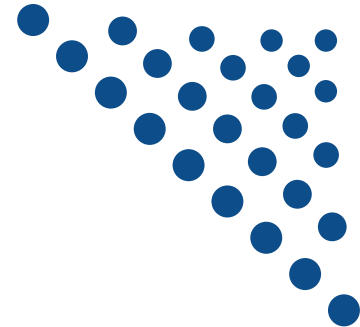


Lighting
Appliances
Hybrid cars



Solar?
Wind?

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



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Policies That Reduce Emissions: Directly



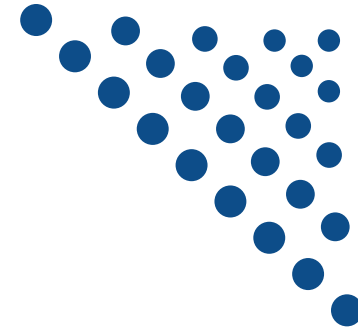
- **Regulation**

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

- **Market oriented policies**

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

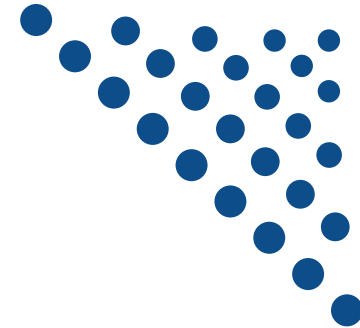
How Does Cap and Trade Work?



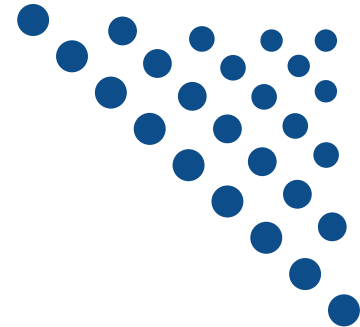
- **Activities to be covered are determined.**
- **Acceptable emissions levels are indicated.**
- **“Permits” that allow acceptable emissions levels are distributed.**
 - How?
 - According to historical emissions?
 - Evenly across emitters?
 - Sold at some price?
- **A “market” is developed.**
- **Those 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:
 - The cost of emitting.
 - The cost of eliminating further emissions.
- **Agency determines equality of permits in possession and emissions.**



How Does a Carbon Tax Work?

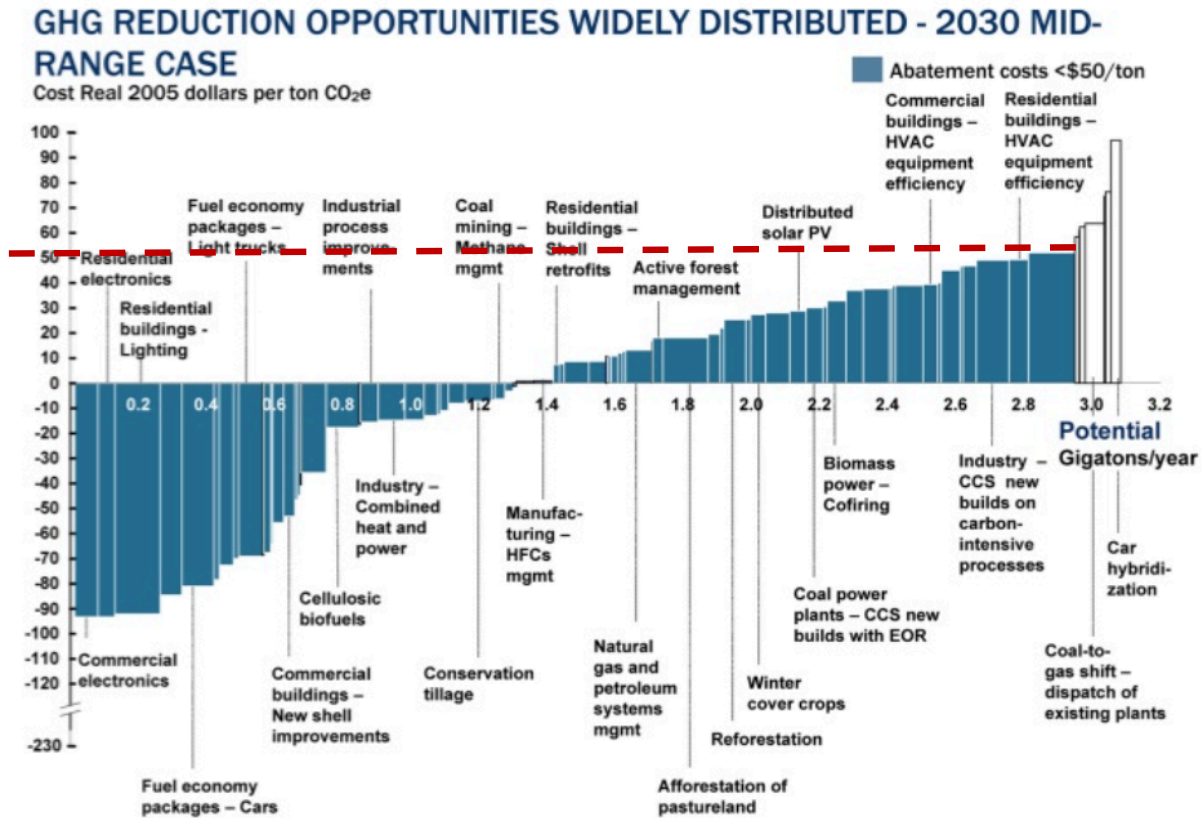


- **Activities to be covered are determined.**
- **The price of emissions (tax) is determined.**
 - Presumably some relation to the social cost of polluting.
- **Emissions are measured.**
- **Taxes are determined and paid.**
- **Q: What happens to the revenue?**



Putting a Price on Carbon

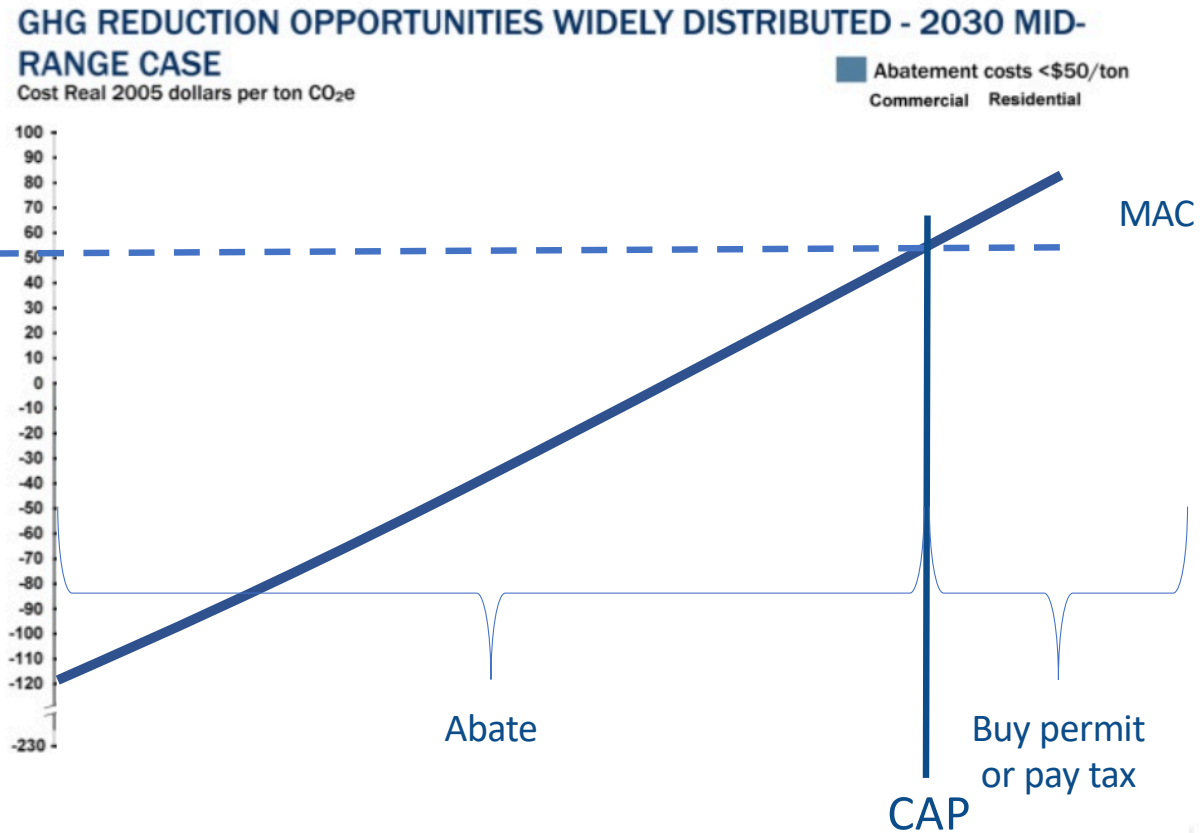
Suppose a Social Cost Of Carbon of \$50



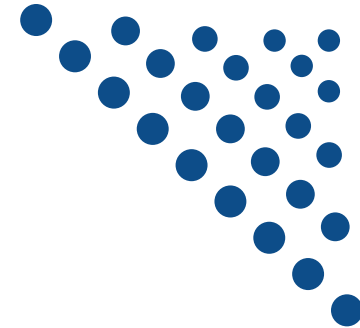
Putting a Price on Carbon



TAX
=
Permit Price
=
Carbon Price



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.



Carbon Tax and Cap & Trade: the Differences



Carbon Tax

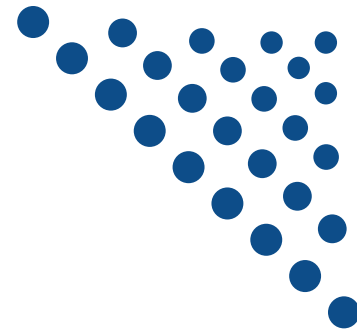
Cap & Trade



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 |

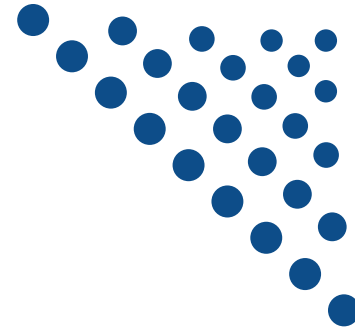


Climate Change Policy in Action



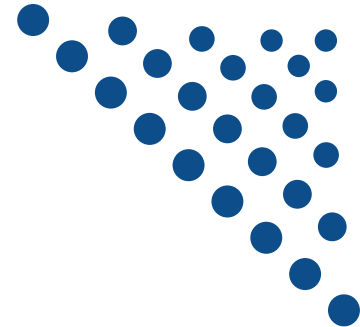
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California's Cap and Trade System: 2012+

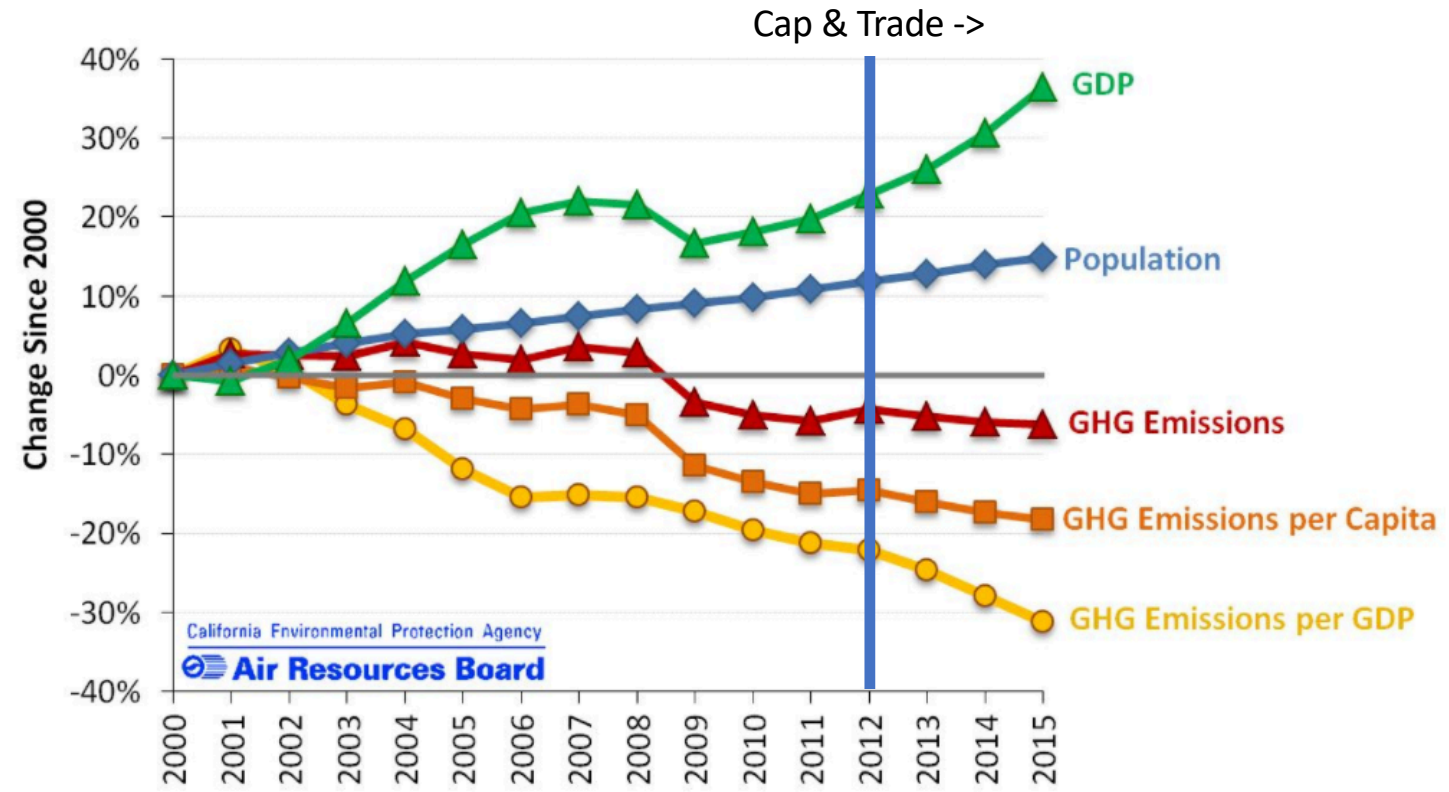


0.7%

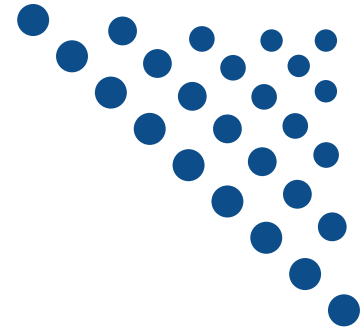
of global
greenhouse gas
emissions



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



Worldwide Carbon Taxes



26

carbon tax
programs

24

national
jurisdictions
covered

5.3%

of global
greenhouse gas
emissions

Sweden's Carbon Tax Policy

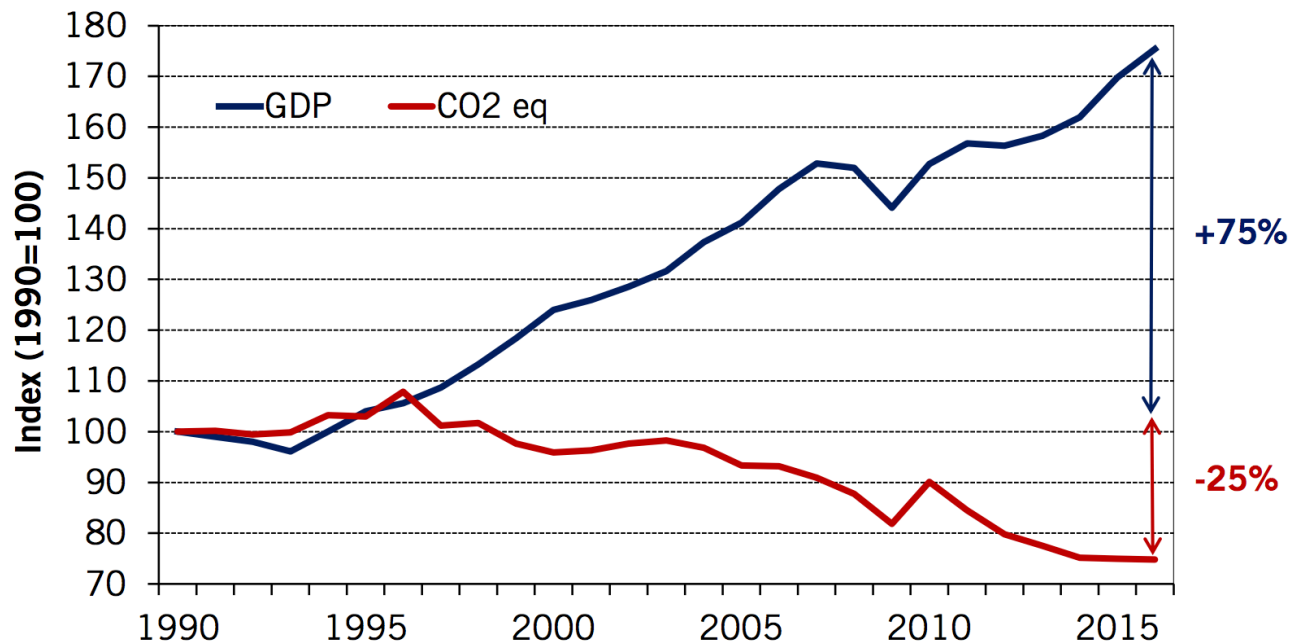


Oldest Carbon
Tax: 1991

\$140/ton



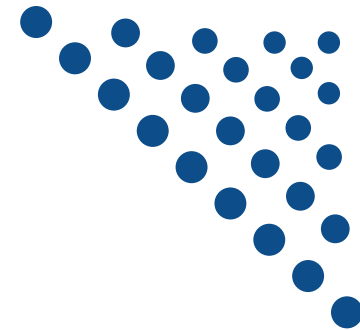
Real GDP and Domestic CO₂eq Emissions¹ In Sweden, 1990-2016



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

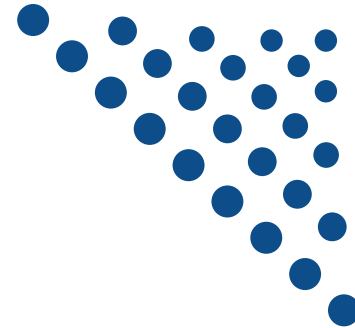
U.S. Carbon Tax Plans



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



Summary

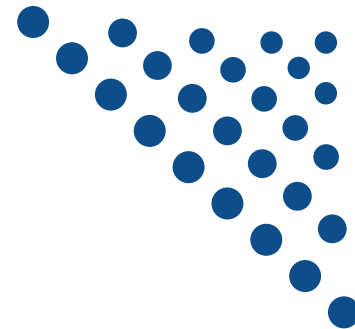


- **There are many ways to reduce emissions.**
- **Economics-inspired policies can help us do this at the lowest cost.**
- **Taxes and cap and trade are proven effective tools to fight climate change!**
- **Other tools may also be necessary.**



Thank you!

Any Questions?



www.NEEDelegation.org

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