

Climate Change Economics

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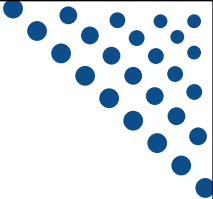


Sons in Retirement

November 17, 2021

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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: 48 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: 500+ 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 Safety Net**
- **Trade and Globalization**
- **Economic Mobility**
- **Immigration**
- **COVID-19**
- **Housing Policy**
- **Federal Budgets**
- **Federal Debt**
- **2017 Tax Law**
- **Autonomous Vehicles**
- **Black-White Wealth Gap**



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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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Outline

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



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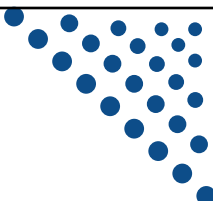


Economics of Climate Change



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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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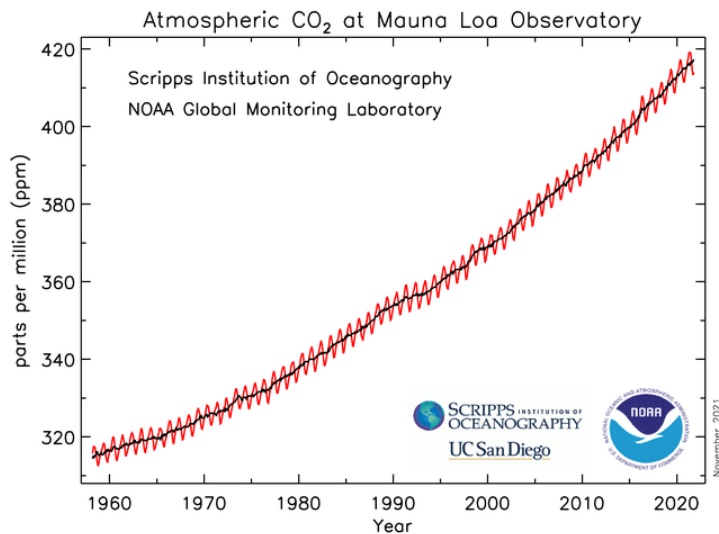
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When Our Decisions Affect Others, We Need Regulation

- **Pollution causes an EXTERNALITY: a side effect (cost or benefit) that affects someone else**
 - Polluting things have an “unfair cost advantage” because part of 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*

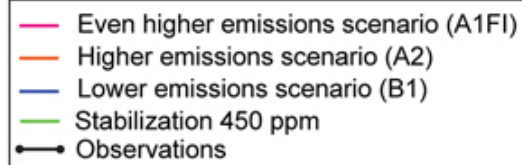
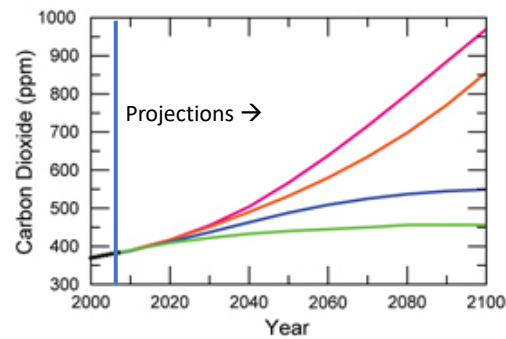


Atmospheric CO₂ Concentrations



Source: NOAA

Atmospheric CO₂ Concentrations



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What Does That Do?

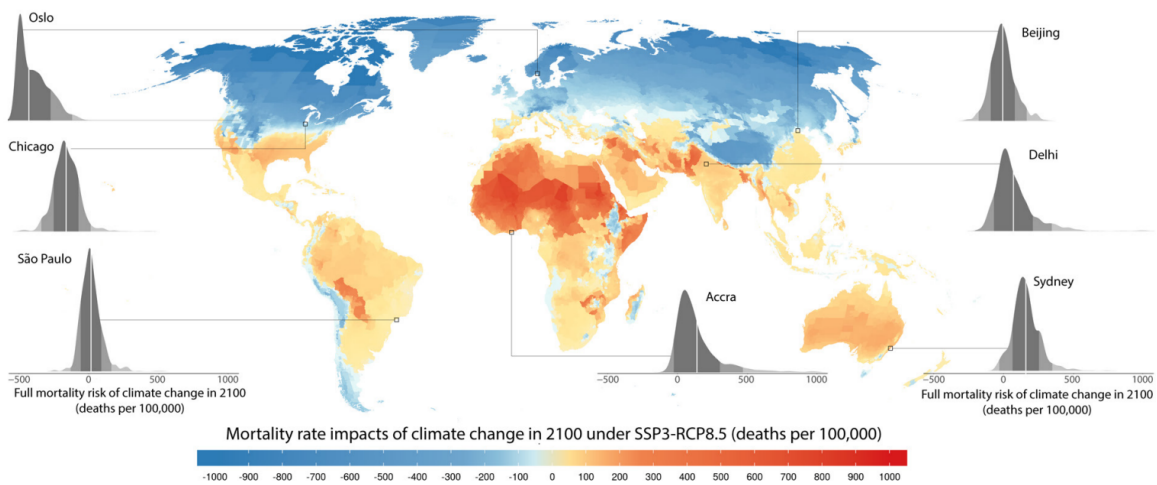
- **Increased temperatures**
 - Sea level rise
 - Storm surges
- **Altered precipitation patterns**
- **More variable weather**
- **More / more powerful storms**
- **Carbon dissolves in ocean**

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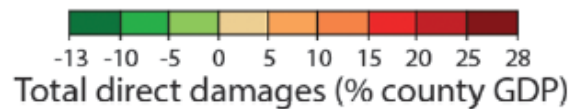
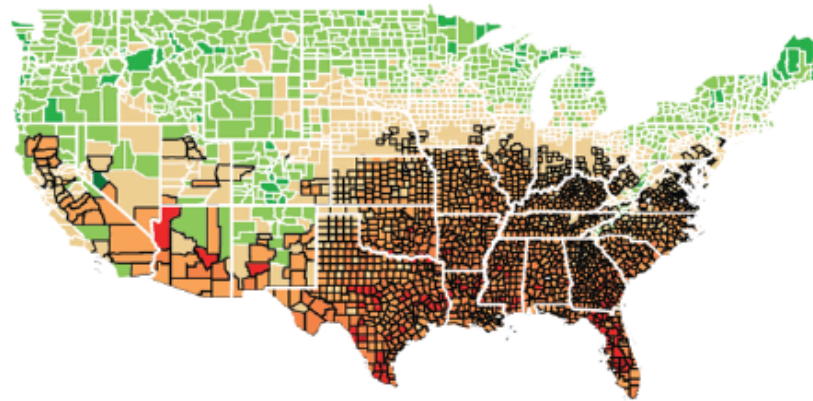
How These Impacts Affect Humans

- 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

How Damages Will Vary Globally: Mortality as an Example



How Damages Will Vary in the US



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Adaptation Reduces Damages

- **Adaptations:** costly actions that reduce damages from climate change.
 - Examples: staying indoors, changing agricultural practices, building seawalls, migration
- The **net cost to society** is the **cost of adaptation** plus the **cost of 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.

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A Climate Change Ladder

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

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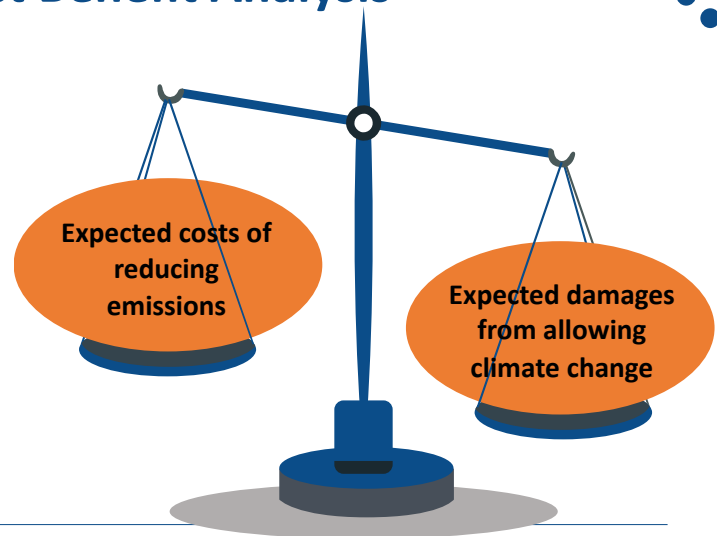
Reducing Emissions

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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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Global Net Emissions

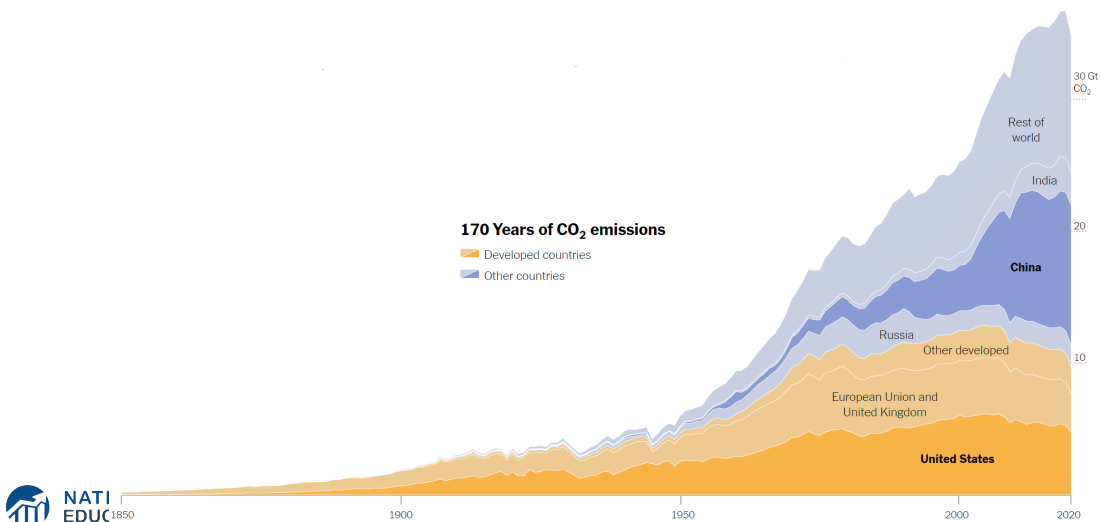
Are What We Care About

- **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



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Sources of the Global Flow of Emissions

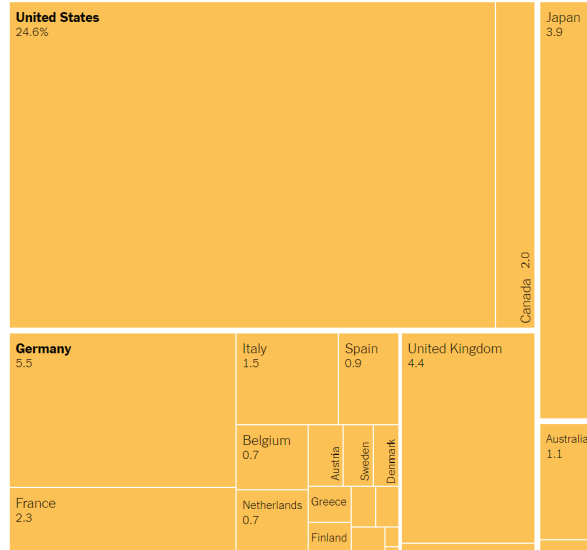


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Sources of the Global Stock of Emissions

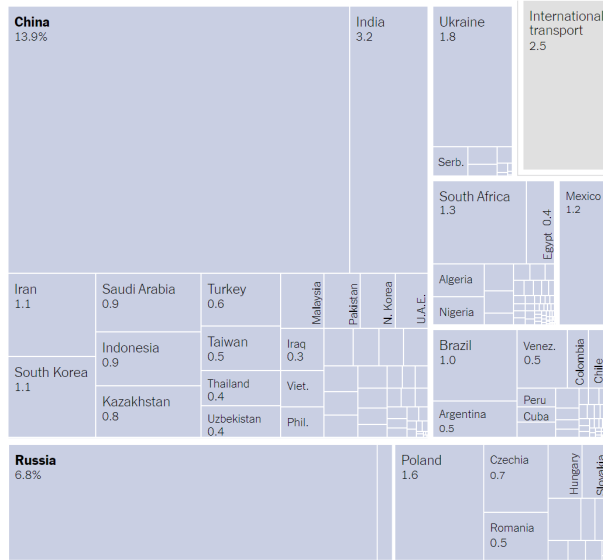
23 rich, developed countries are responsible for half of all historical CO₂ emissions.



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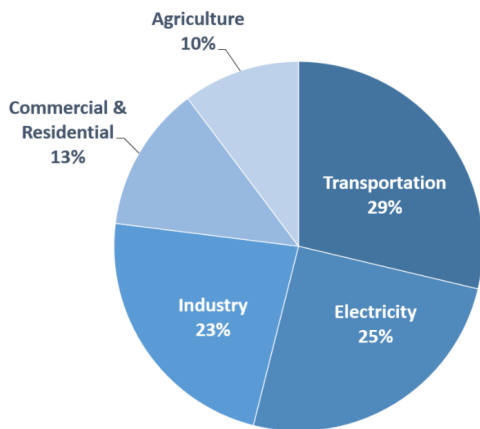
Sources of the Global Stock of Emissions

More than 150 countries are responsible for the other half.



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Total U.S. Greenhouse Gas Emissions by Economic Sector in 2020

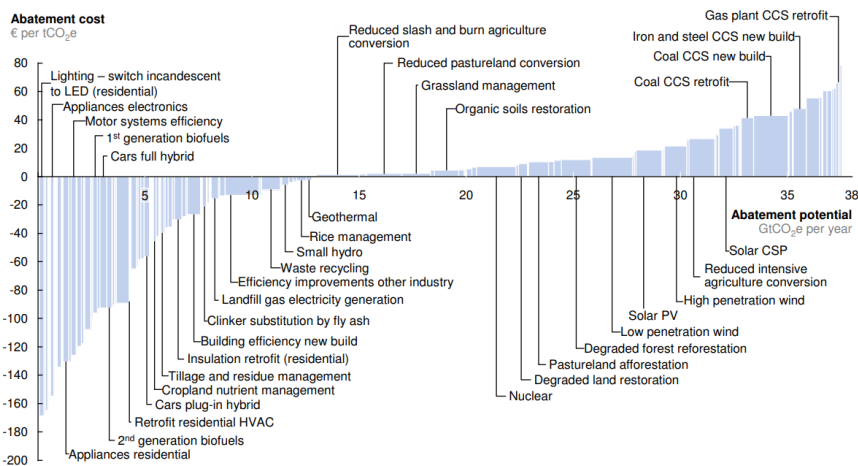


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Total Emissions in 2019 = 6,558 Million Metric Tons of CO₂ equivalent. Percentages may not add up to 100% due to independent rounding.

Example Global Abatement Cost Curve

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 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

- **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)



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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) – though new evidence is increasingly questioning this.
- Cap and trade and carbon tax can generate revenues that can be used to offset the regressivity.
- 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**

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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**

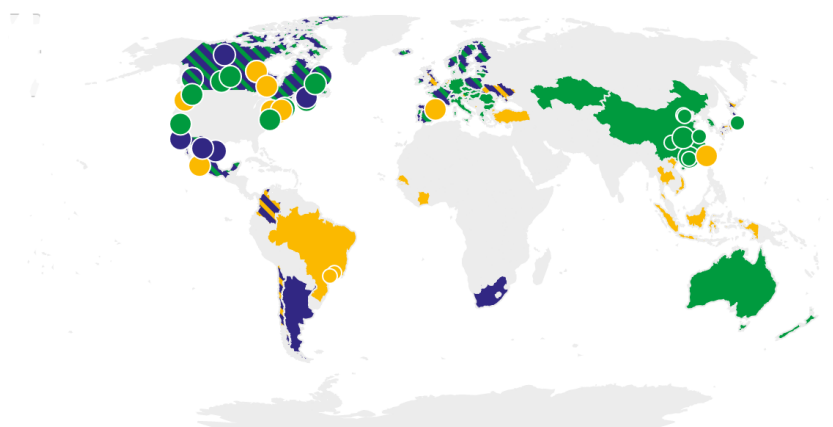
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Climate Change Policy in Action



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Incentive-Based Climate Policies Right Now



- ETS implemented or scheduled for implementation
- Carbon tax implemented or scheduled for implementation
- ETS or carbon tax under consideration
- ETS and carbon tax implemented or scheduled
- ETS implemented or scheduled, ETS or carbon tax under consider...
- Carbon tax implemented or scheduled, ETS under consideration



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California's Cap and Trade System: 2012+



0.7%

of global
greenhouse gas
emissions



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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

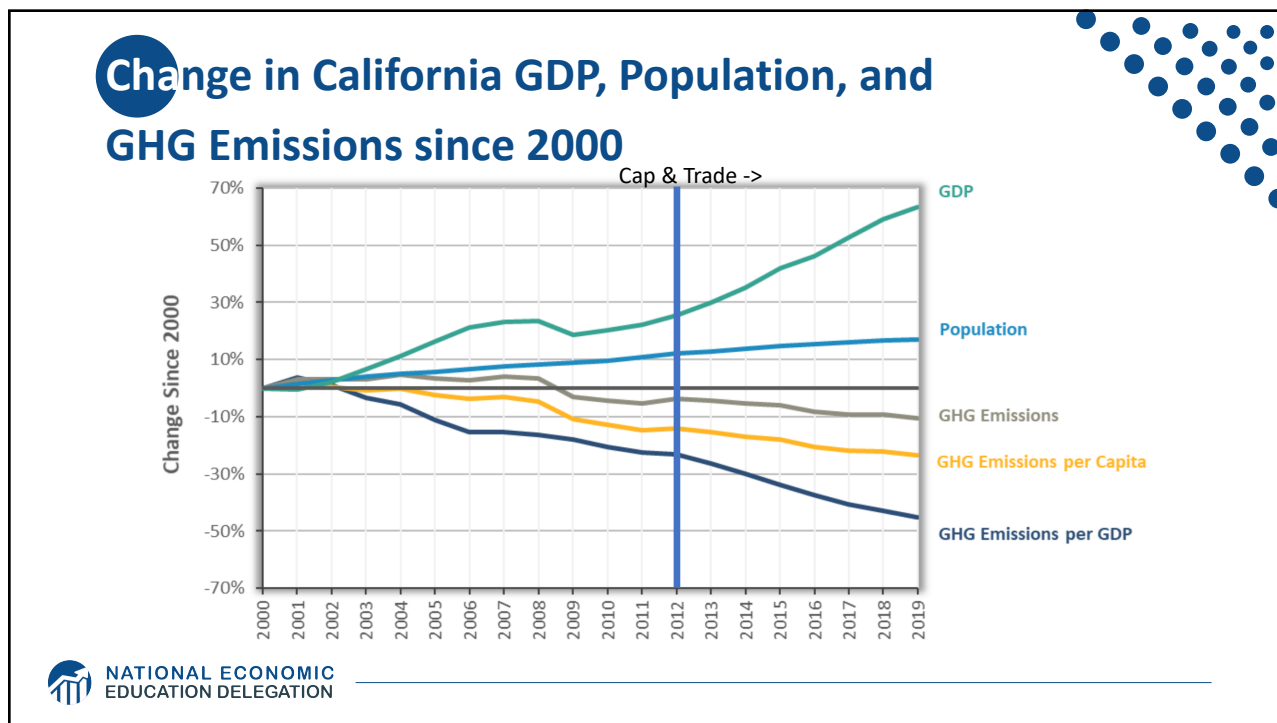
- **California's Tools:**

- Cap and Trade
- Renewable Portfolio Standard
- Clean Cars Program
- Low Carbon Fuel Standard

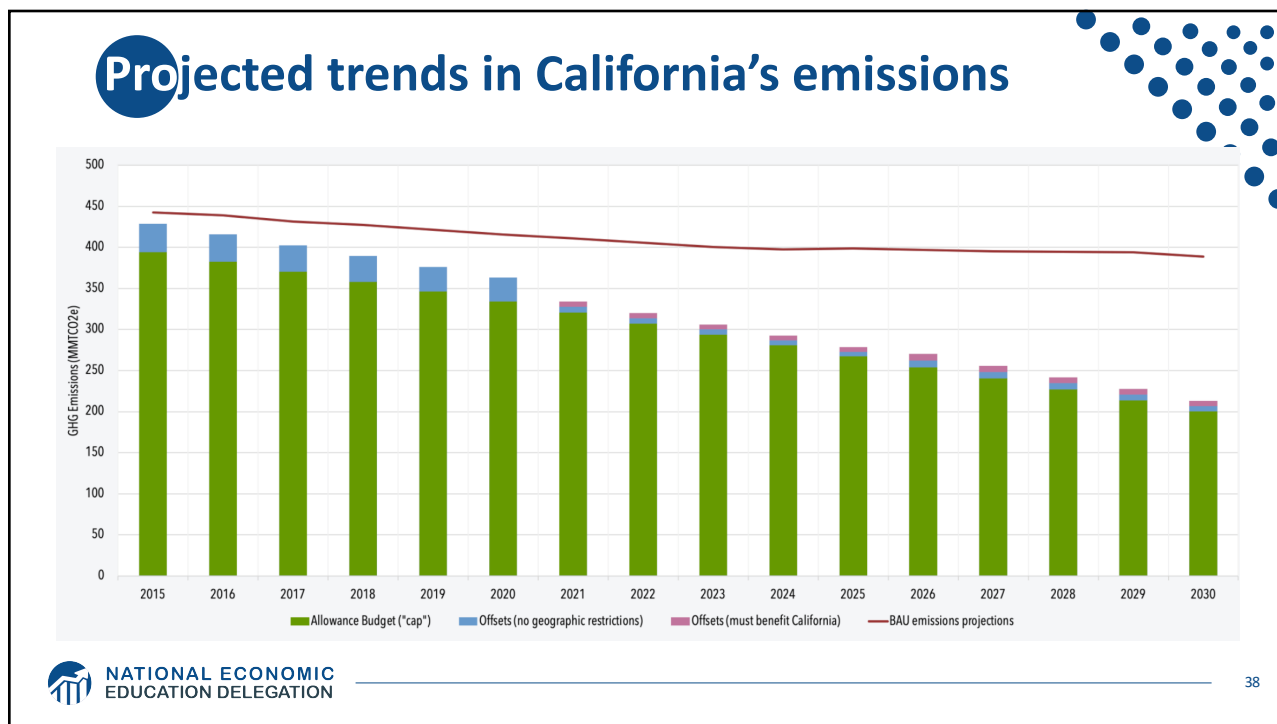


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Summary

- 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!

Questions?

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