


# Climate Change Economics

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NEED

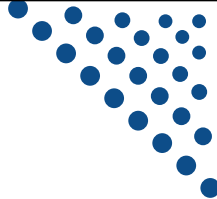


## Kiwanis Club of San Diego

August 16, 2022

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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 are intended to reflect the consensus of the economics profession.




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## Who Are We?

- **Honorary Board: 54 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: 651+ 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: 49 Ph.D. Economists**

- Aid in slide deck development



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## Available NEED Topics Include:

- Healthcare Economics
- US Economy
- Climate Change
- Economic Inequality
- Economic Mobility
- Trade and Globalization
- Minimum Wages
- Immigration Economics
- Housing Policy
- Federal Budgets
- Federal Debt
- Black-White Wealth Gap
- Autonomous Vehicles
- US Social Policy



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## Credits and Disclaimer

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  - 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

- **Impacts of Climate Change**
- **Reducing Emissions**
- **Climate Change Policy**



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## How Can Economists Help Fight Climate Change?

- By assessing behavioral reactions to climate change.
- By measuring climate change damages and estimating the costs of fighting climate change.
- By designing smart policies that minimize costs to society.



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## Econ 101: When Everything Is Simple, No Regulation Is Needed for Efficiency

- Simple transactions: buyer and seller feel all costs and benefits of sales
- They choose based on the costs & benefits they feel
- → Efficient number of transactions! (Maximizes social benefits)



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## When Our Decisions Affect Others, We Need Regulation

- Pollution causes an **EXTERNALITY**: a side effect (here, a cost) 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” amount of pollution balances costs & benefits of pollution*



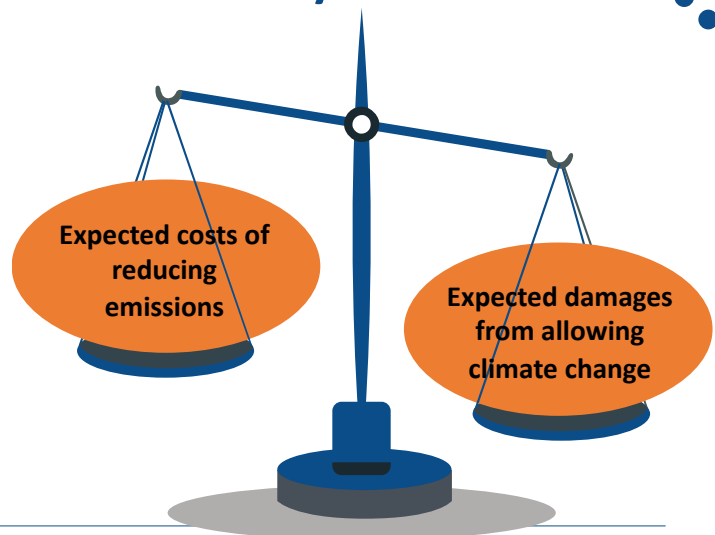
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## How Economists Decide How Much to Fight Climate Change: Cost Benefit Analysis

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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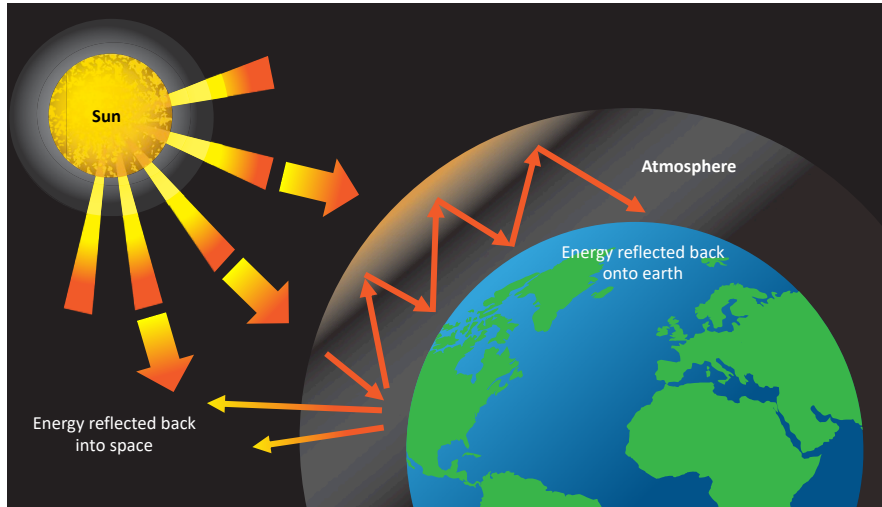
## Climate Change



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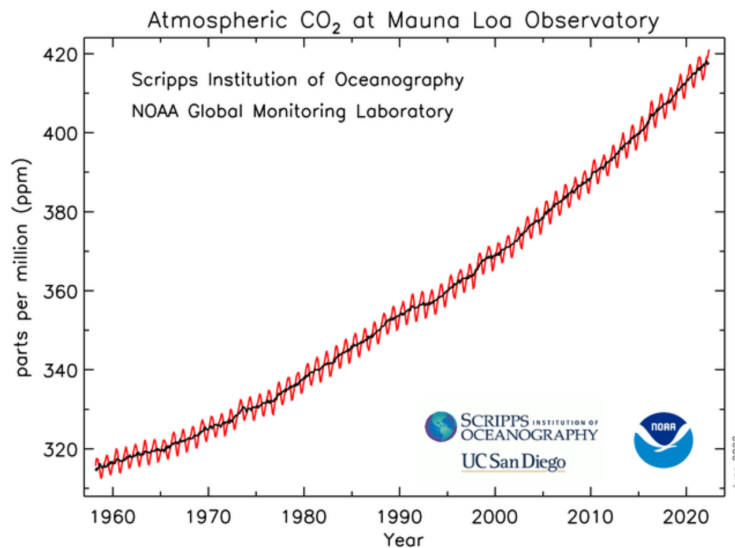
# The Atmospheric Greenhouse Effect



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# Atmospheric CO<sub>2</sub> Concentrations Up To Now



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Source: NOAA

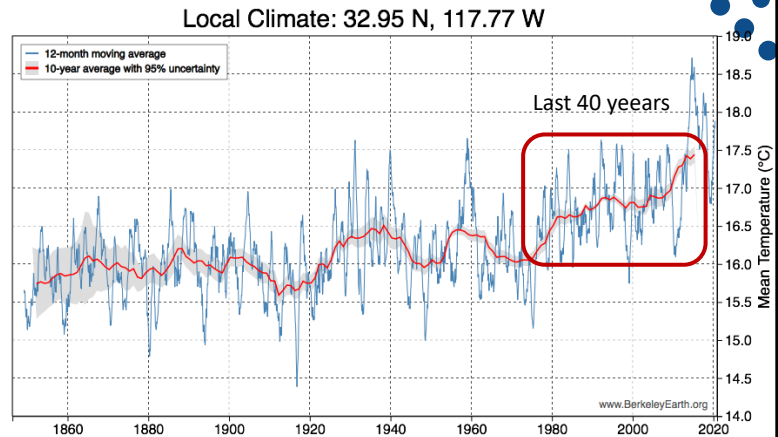
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## These Changes Are Already Underway

Use

<http://berkeleyearth.lbl.gov/city-list/> to see the temperature history of a city!

Here's San Diego.



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## How Climate Change Affects 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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## Social Cost of Carbon

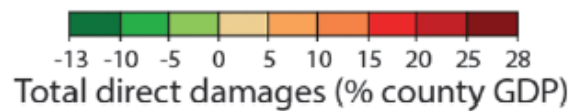
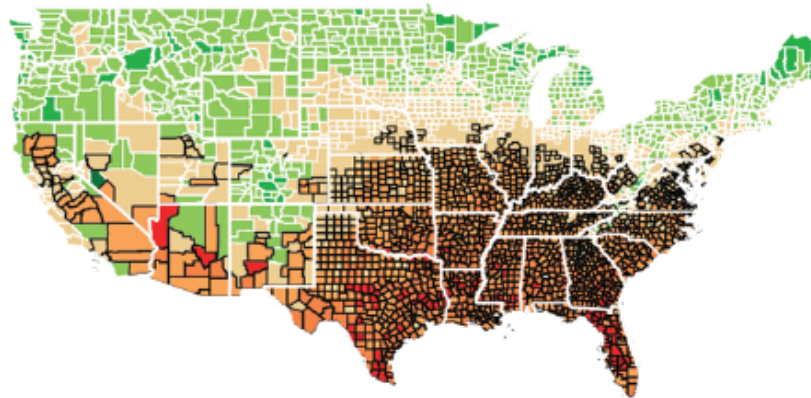
- The expected cost of damages from each unit of greenhouse gas emissions.
- Current EPA estimate: ~\$51 per metric ton of CO<sub>2</sub> (but estimates vary a lot!)
  - About \$157/car per year.
  - \$32 Billion for all vehicles in the US.
- Social cost of carbon will increase over time.



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## How Damages Will Vary in the US



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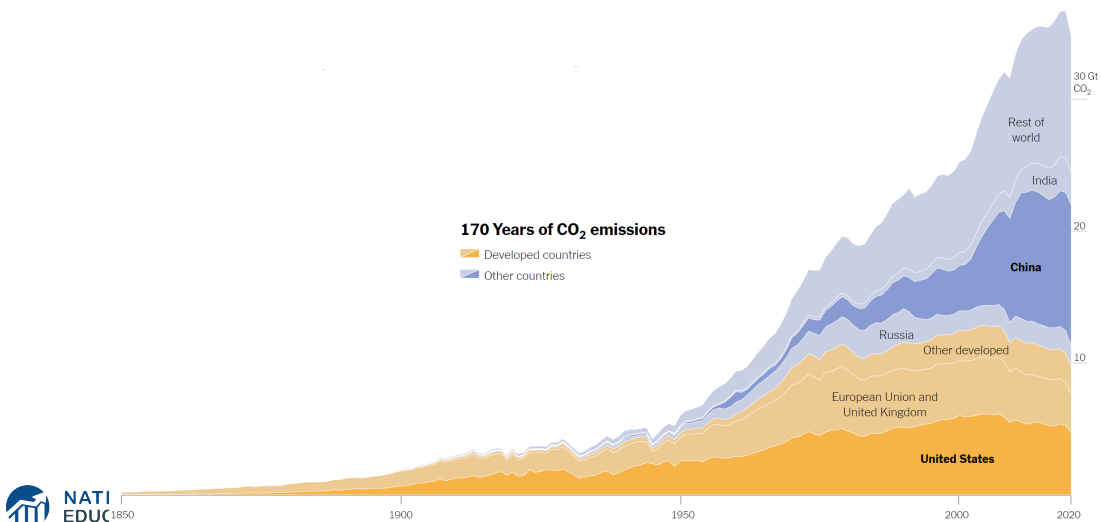
## Global Net Emissions Are What We Care About

- **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 (including CO<sub>2</sub>) we put out**
- **Greenhouse gas sinks: ways to pull CO<sub>2</sub> out of the air**
  - Existing: oceans, forests
  - Increase sinkage by planting trees, or other measures



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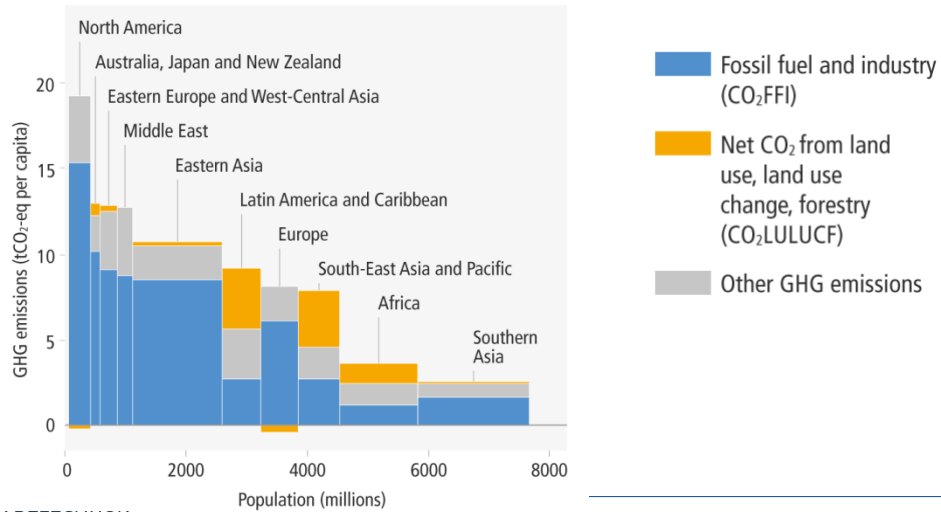
## Sources of the Global Flow of Emissions



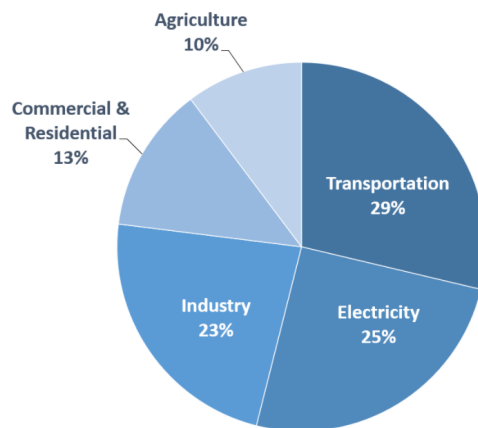
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## How Does This Look Per Capita (Per Person)?

c. Net anthropogenic GHG emissions per capita and for total population, per region (2019)



## Total US Greenhouse Gas Emissions by Economic Sector in 2020



Total Emissions in 2019 = 6,558 Million Metric Tons of CO<sub>2</sub> equivalent. Percentages may not add up to 100% due to independent rounding.

# Which Emissions Should We Cut?

- List all possible ways to reduce emissions
- Figure out how much each costs per unit of emissions reduced
- Figure out how much each can reduce in total
- Line them up in order: cheapest to costliest
  - → Tackle first the cheapest ones!

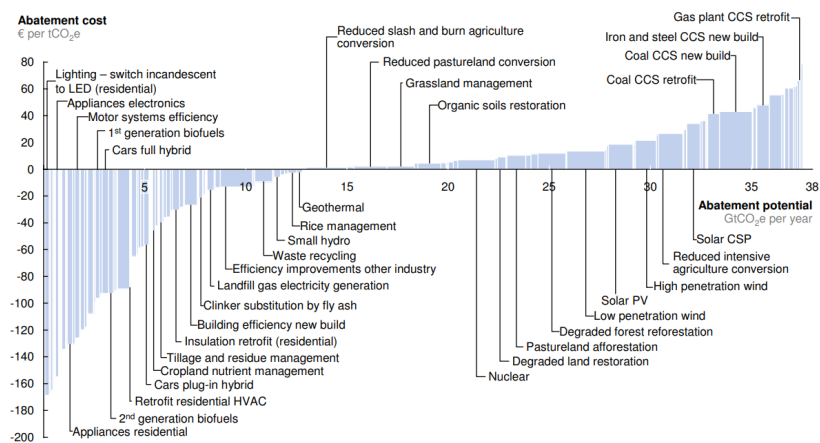


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## Example Abatement Cost Curve

(Don't trust these numbers, this is just to show the idea)

V2.1 Global GHG abatement cost curve beyond BAU – 2030



Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €80 per tCO<sub>2</sub>e 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

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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 vs hi-income families)
  - However, new evidence increasingly questions this.
- Cap and trade and carbon tax can generate revenues that can be used to offset the regressivity.
  - E.g.: “carbon dividend”
- Command and control regulations do not.

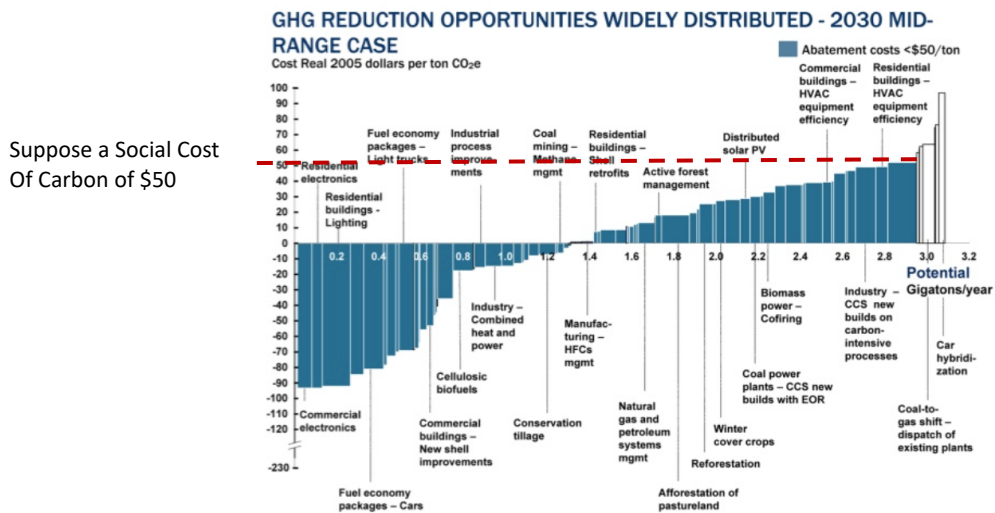
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# How Does a Carbon Tax Work?

- 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**

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# Putting a Price on Carbon



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## 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.

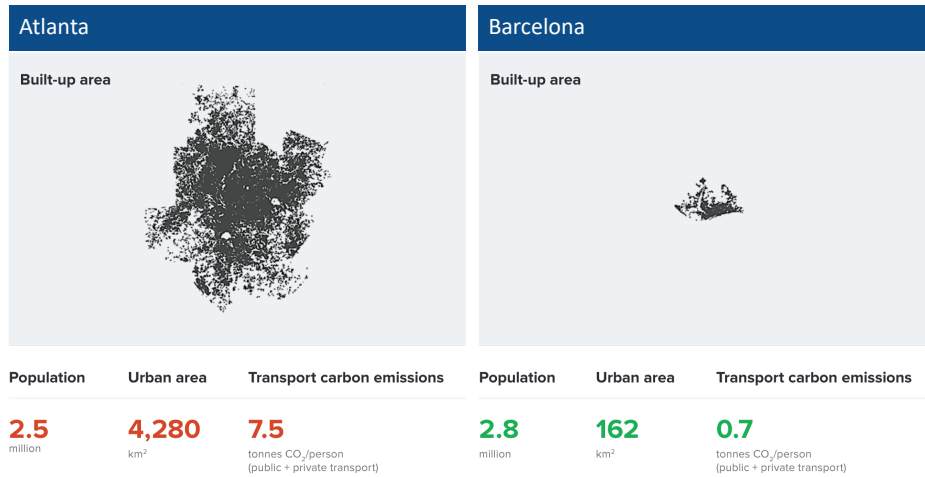


## Examples of Other Policies that Reduce Emissions

- **Research and development 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**



## Atlanta and Barcelona Have Similar Populations but Very Different Carbon Productivity



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Source: New Climate Economy Report, 2014

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## Inflation Reduction Act of 2022

- Psssst.... It's not about reducing inflation, but that's ok.
- Major provisions include:
  - Clean Electricity Tax Credits
  - Funding Programs to Support Local Clean Investment
  - Clean Vehicles Incentives
  - Agriculture and Conservation
  - Funding, Investments, and Incentives for Heavy Industry and Manufacturing
- Result: Emissions reductions of 40% or more by 2030.



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Source: <https://www.nrdc.org/experts/amanda-levin/top-climate-elements-senate-budget-reconciliation>

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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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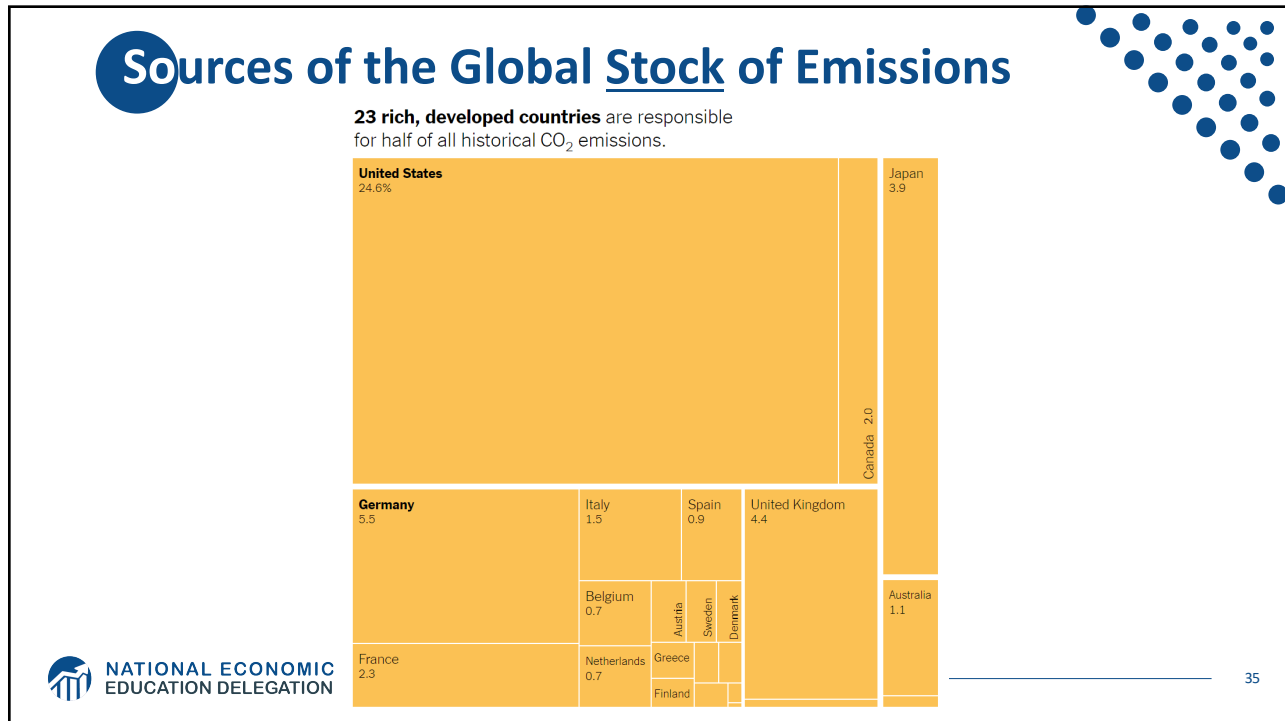
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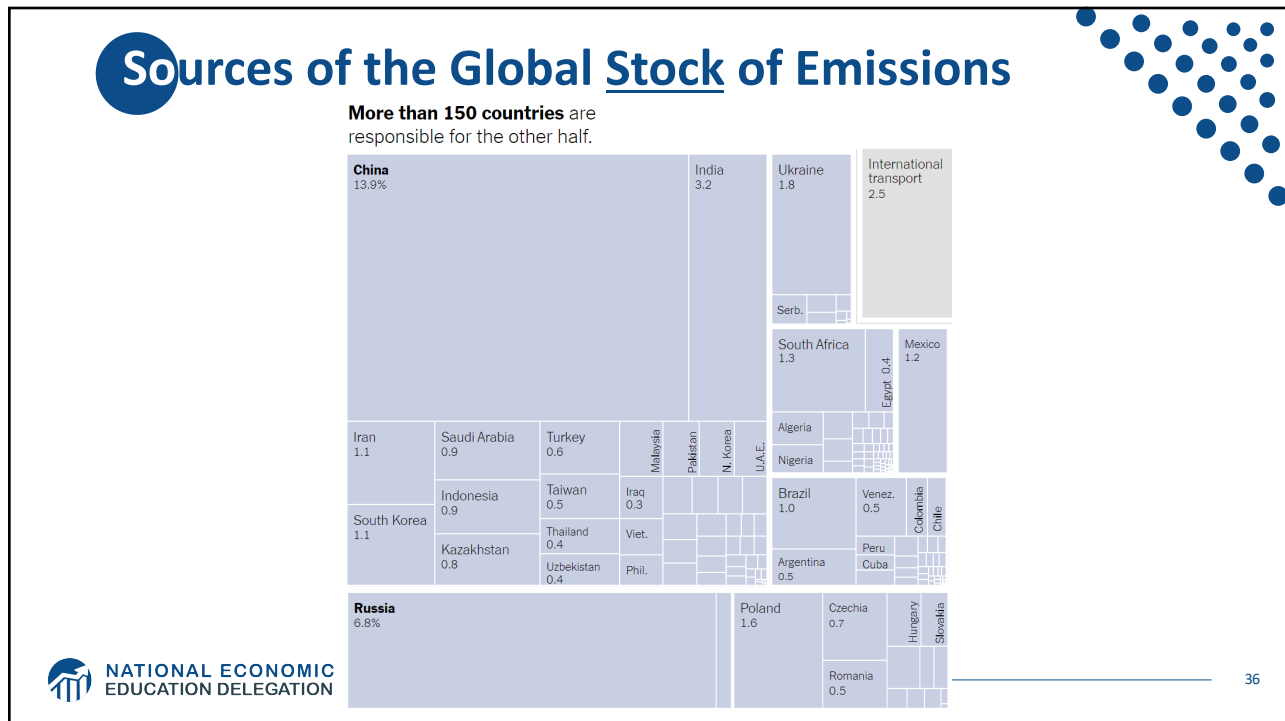
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