



Osher Lifelong Learning Institute, Fall 2022

Contemporary Economic Policy Issues

University of California, Santa Cruz
Fall, 2022

Jon Haveman, Ph.D.
National Economic Education Delegation



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1

1



Course Outline

- **Contemporary Economic Policy**

- Week 1 (10/3): Economic Update (Jon Haveman, NEED)
- **Week 2 (10/10): Climate Change Economics (Trevor O'Grady)**
- Week 3 (10/17): Economics of Immigration (Roger White, Whittier College)
- Week 4 (10/24): Autonomous Vehicles (Jon Haveman, NEED)



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2

2

Submitting Questions

- Please submit questions of clarification in the chat.
 - I will try to handle them as they come up.
- We will do a verbal Q&A once the material has been presented.
- OLLI allowing, we can stay beyond the end of class to have further discussion.
- Slides will be available from the NEED website tomorrow (https://needelegation.org/delivered_presentations.php)

3

Climate Change Economics

Trevor O'Grady
The College of New Jersey

University of California, Santa Cruz

October 10, 2022



4

Credits and Disclaimer

- **This slide deck was authored by:**
 - Shana McDermott, Trinity University
 - Sarah Jacobson, Williams College
 - Sharon Shewmake, Western Washington University
- **This slide deck was reviewed by:**
 - Jason Shogren, University of Wyoming
 - Walter Thurman, North Carolina State University
- **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).



5

Outline

- **Economic Building Blocks**
- **Climate Change**
- **Impacts of Climate Change**
- **Reducing Emissions**
- **Climate Change Policy**
- **Policy in Action**



6



Economic Building Blocks



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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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8

8

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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9

9

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*



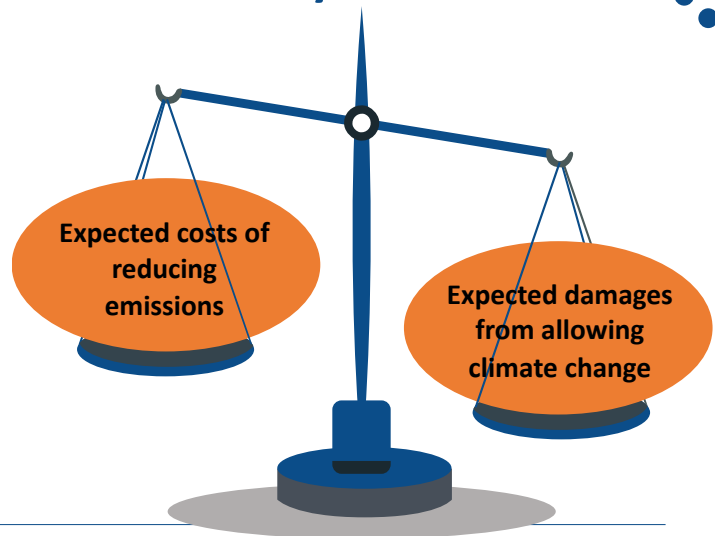
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10

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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12

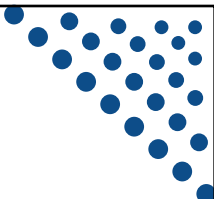


Climate Change




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13



A Climate Change Ladder

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

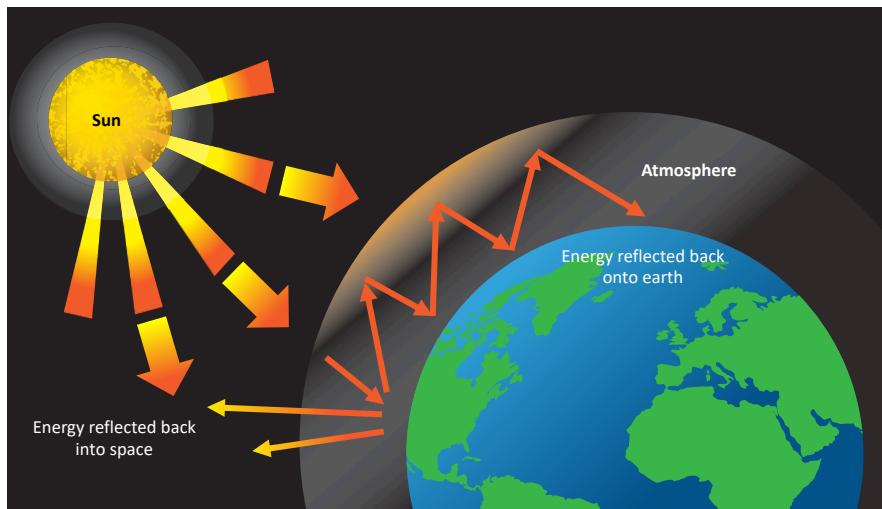


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14

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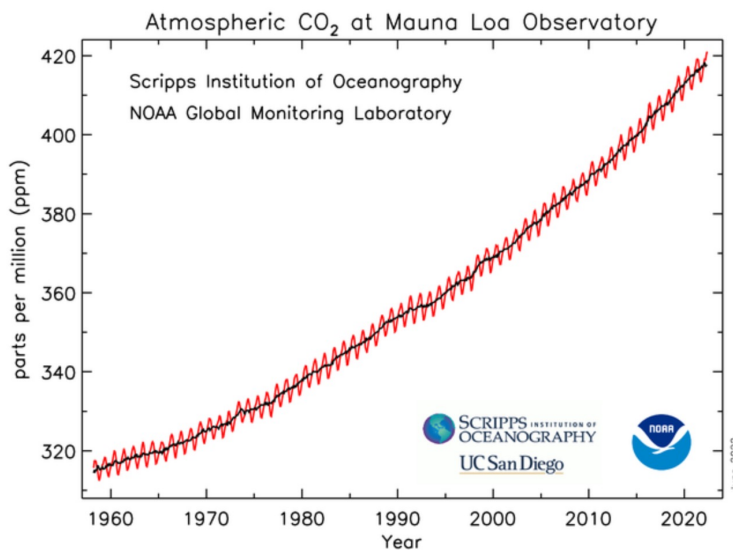
The Atmospheric Greenhouse Effect



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15

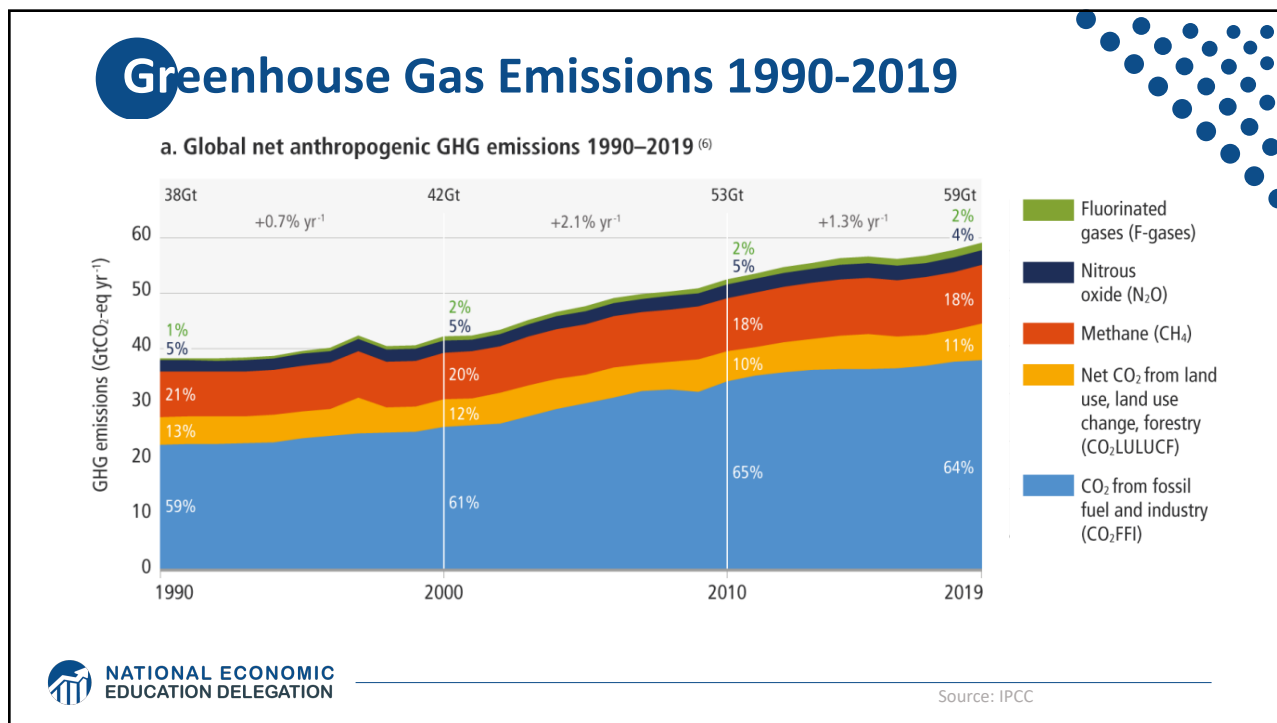
Atmospheric CO₂ Concentrations Up To Now



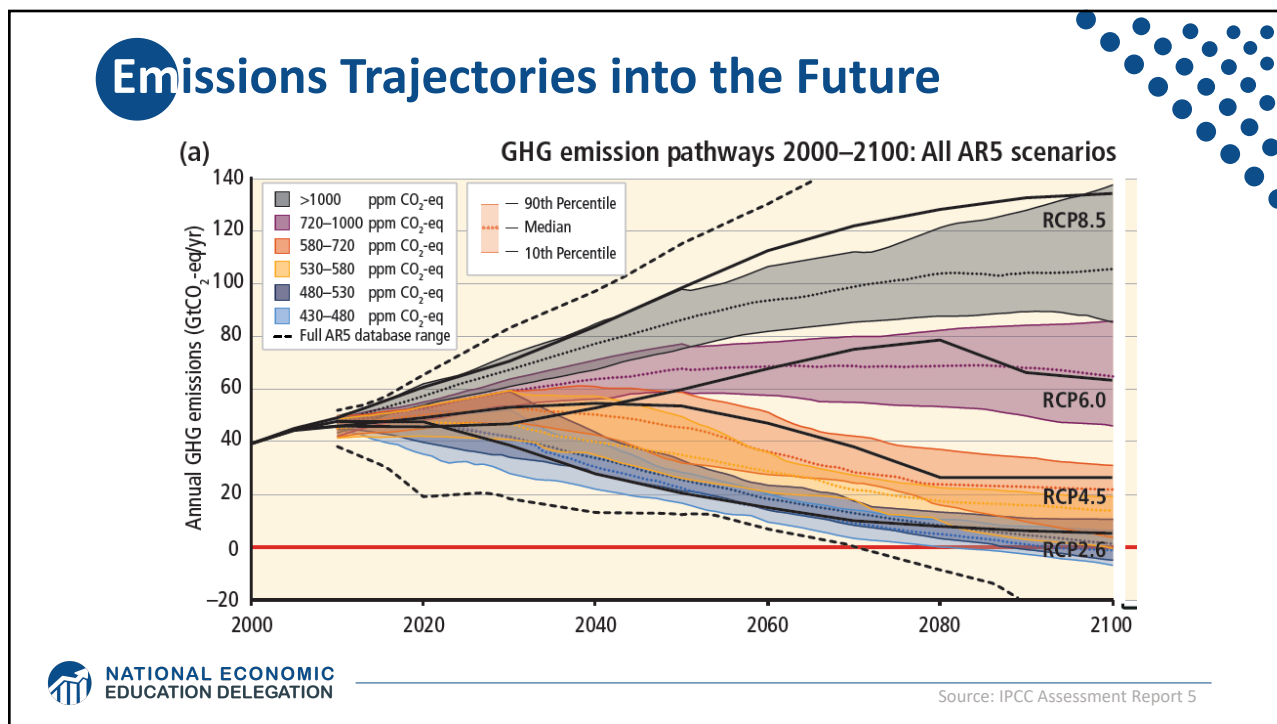
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Source: NOAA

16



17



18

What Do Greenhouse Gas Emissions Do to the Planet?

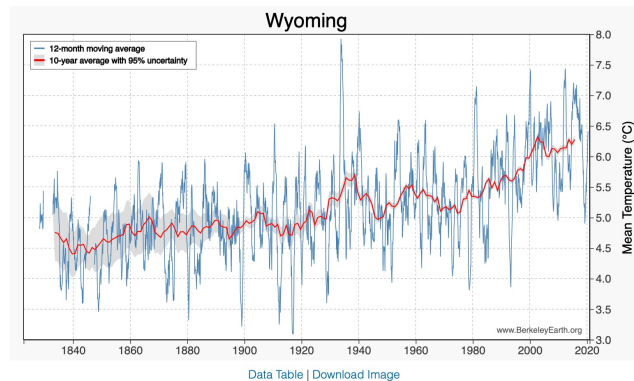
- **Increased temperatures**
 - Sea level rise
 - Storm surges
- **Altered precipitation patterns**
- **More variable weather**
- **More / more powerful storms**
- **Carbon dissolves in ocean**

19

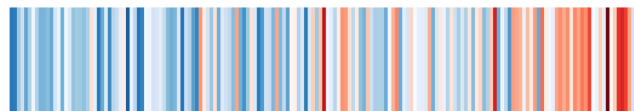
These Changes Are Already Underway

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

Here's Wyoming.



Climate Stripes



20

Impacts of Climate Change

21

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

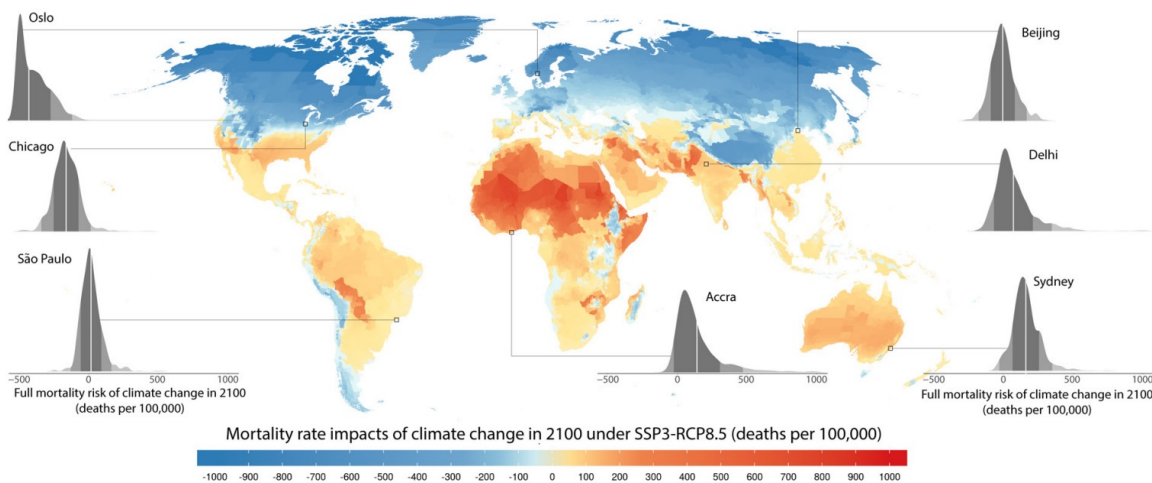
22

Social Cost of Carbon

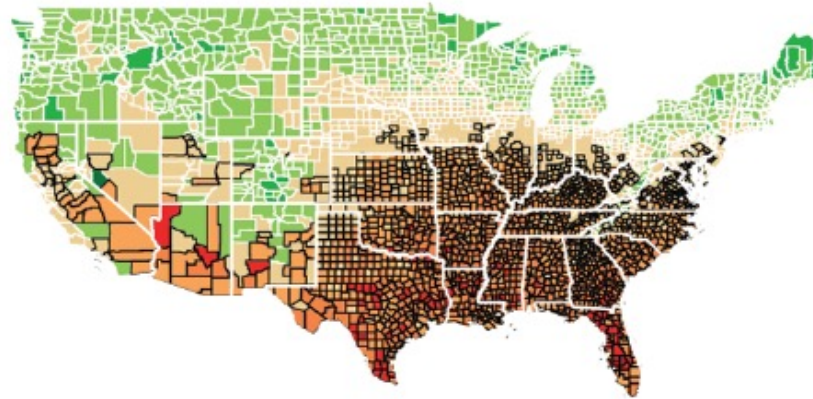
- The expected cost of damages from each unit of greenhouse gas emissions.
- Current EPA estimate: ~\$51 per metric ton of CO₂ (but estimates vary a lot!)
 - About \$157/car per year.
 - \$32 Billion for all vehicles in the US.
- Social cost of carbon will increase over time.



How Damages Will Vary Globally: Mortality as an Example



How Damages Will Vary in the US



-13 -10 -5 0 5 10 15 20 25 28
Total direct damages (% county GDP)



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25

25

Adaptation Reduces Damages

- *Adaptation*: costly action that reduce damages from climate change.
- The **net damage cost to society** is the **cost of adaptation** plus the **cost of remaining damages**.
- People and firms will take some actions on their own, up to the point where they find it worthwhile.
- Some adaptation requires government involvement.



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Individual-Level Adaptation

- **Perhaps you...**
 - Stay inside more.
 - Turn on the air conditioning.
- **Farmers may:**
 - Plant at different times.
 - Plant new crops.
- **Businesses may:**
 - Give outdoor workers water / shade breaks.
- **Everyone might:**
 - Think about moving to a safer place.



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**
- **Policies that protect workers or low-income and vulnerable populations**
- **Planned retreat (moving a community)**



Reducing Emissions



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29

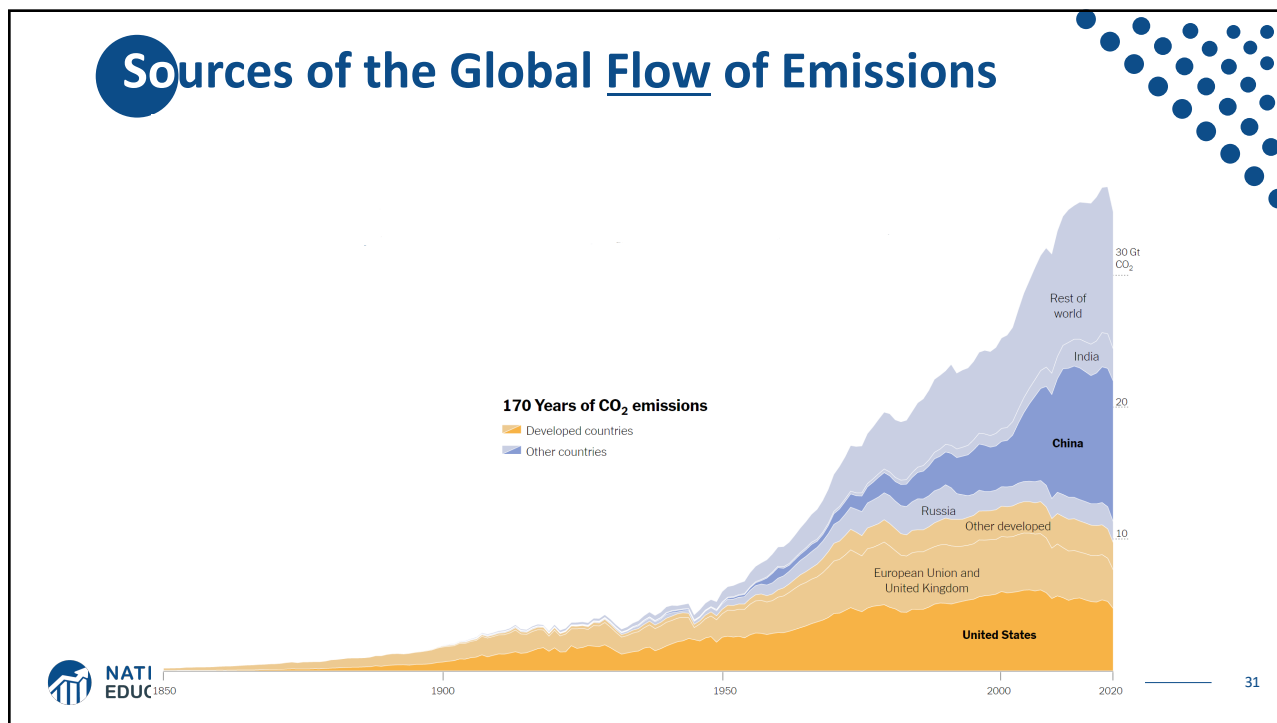
Global Net Emissions Are What We Care About

- **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 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

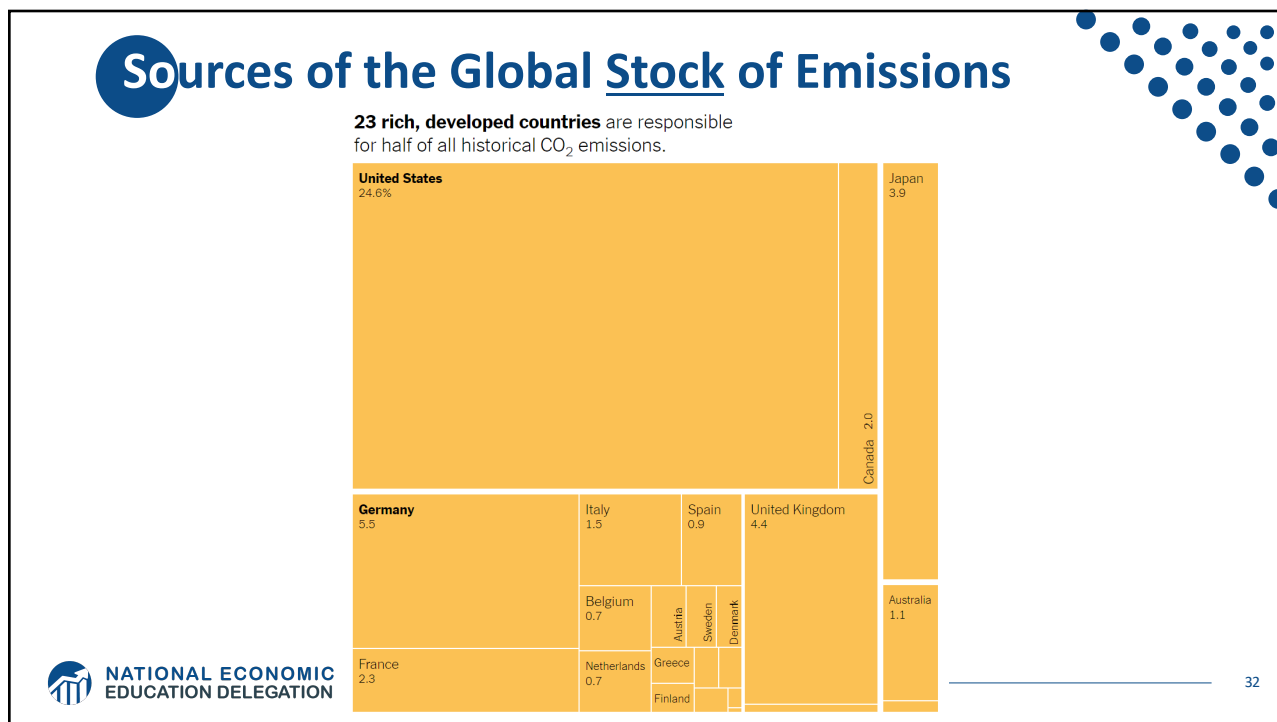


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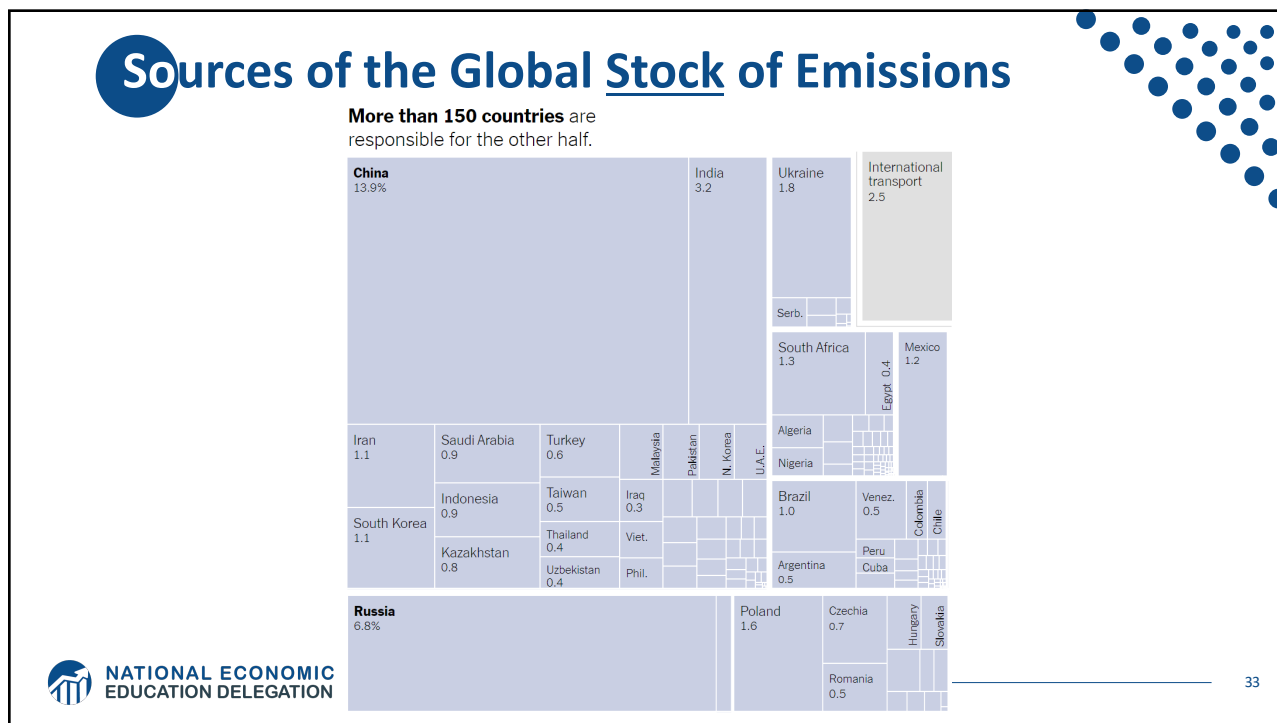
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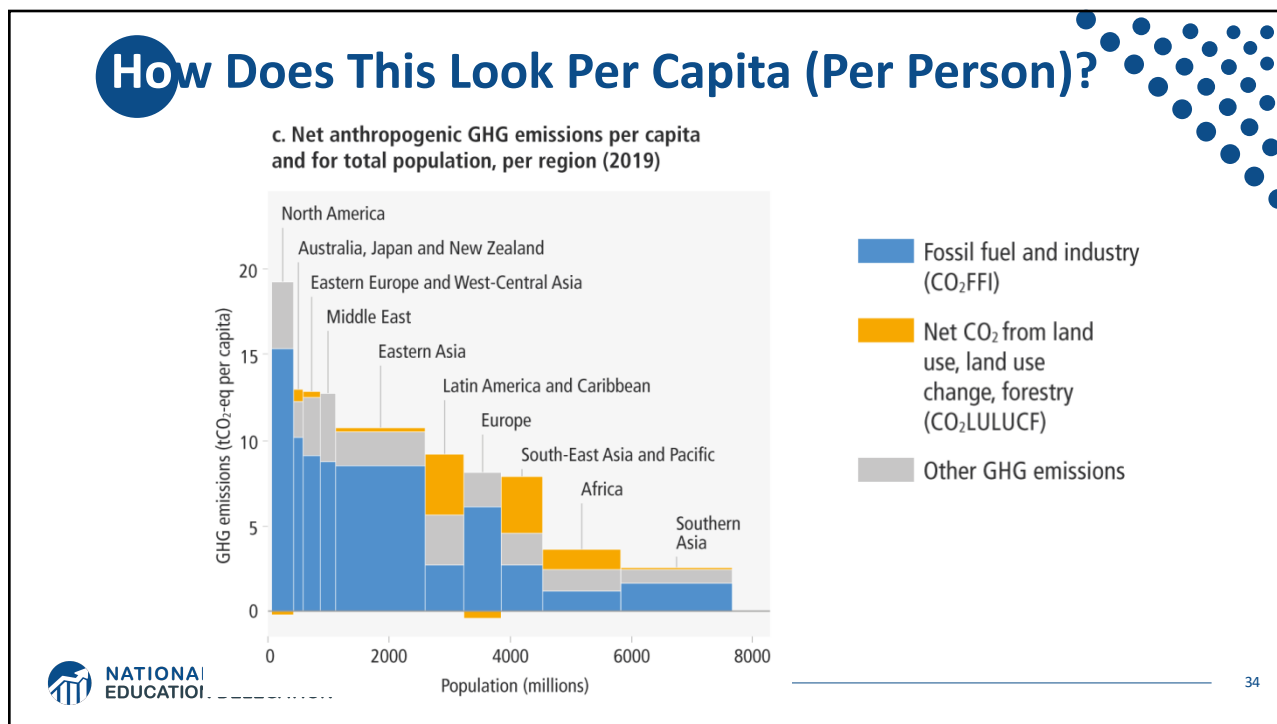
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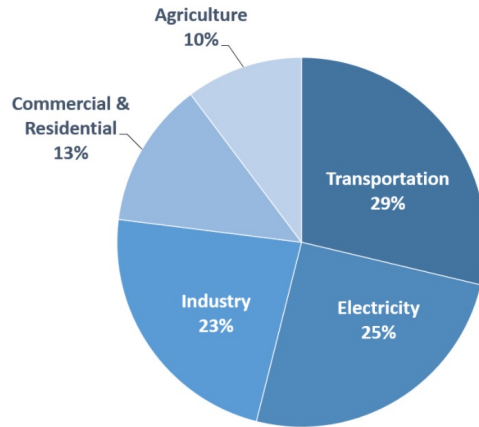


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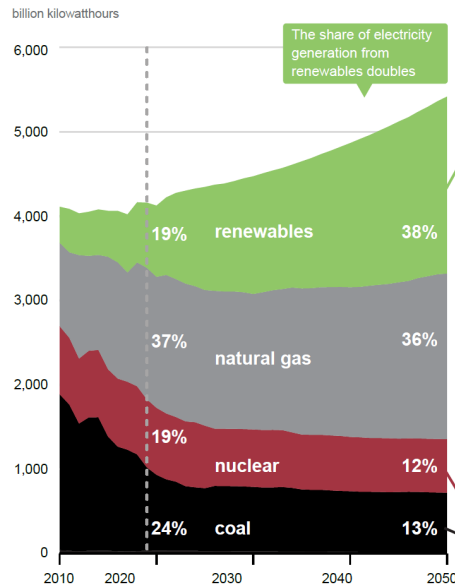
Total US Greenhouse Gas Emissions by Economic Sector in 2020



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

35

US Electricity Sources



36

Which Emissions Should We Cut?

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

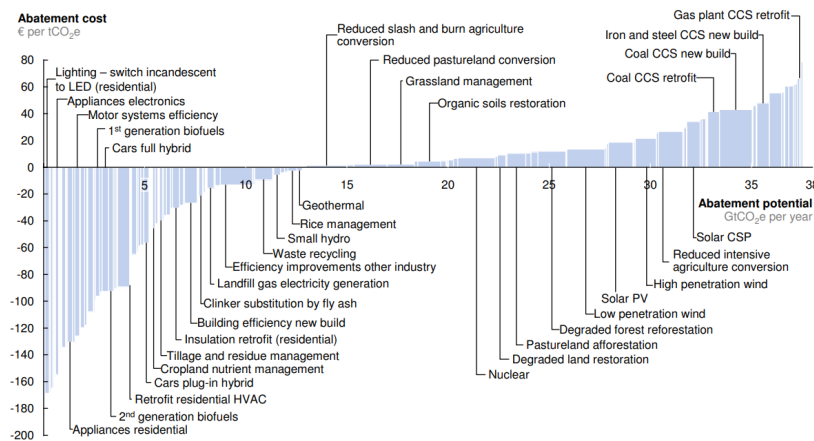


37

Example Abatement Cost Curve

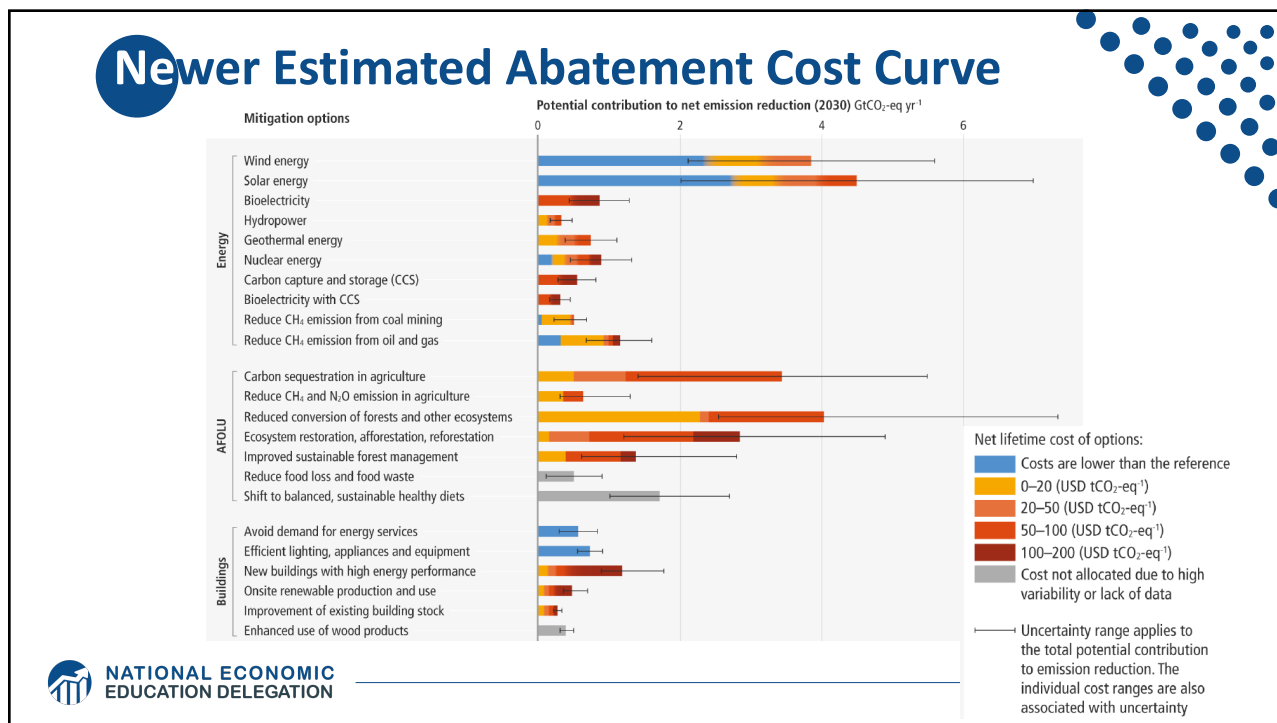
(Don't trust these numbers, this is just to show the idea)

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

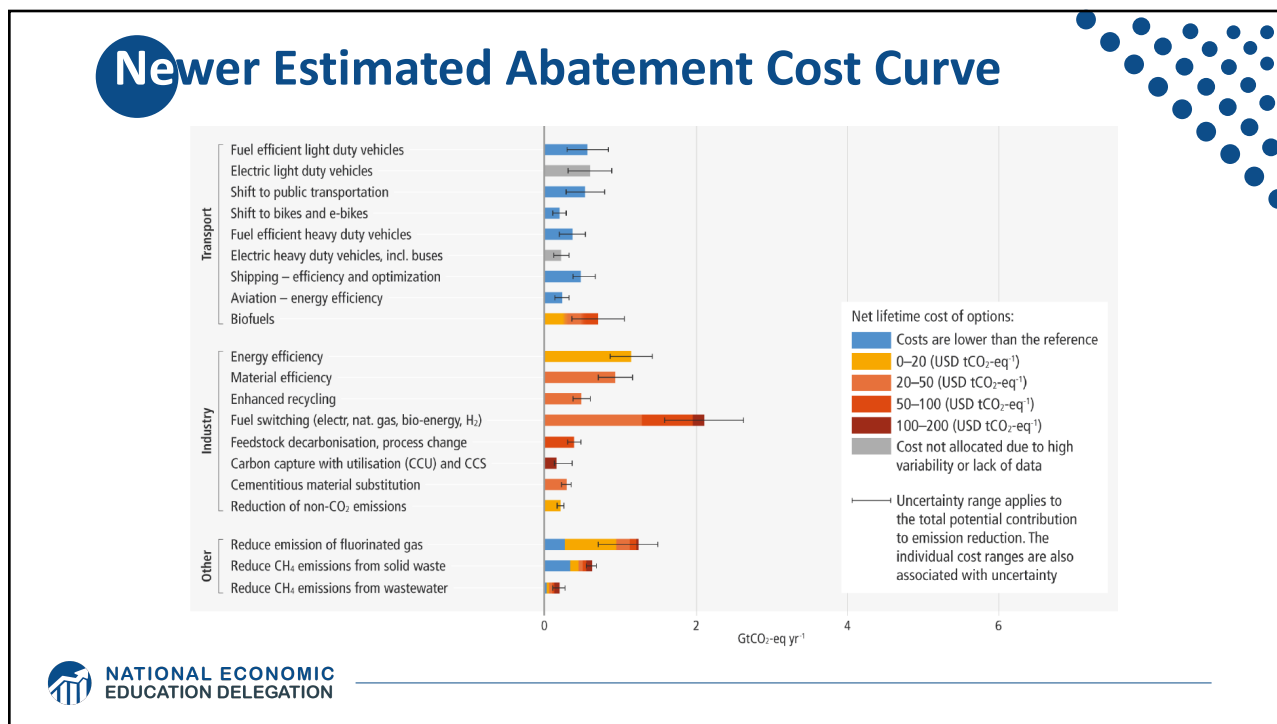


Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €80 per tCO₂e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.
Source: Global GHG Abatement Cost Curve v2.1

38



39



40

Costs and Barriers Can Be Difficult to Assess

- **Difficult to project future costs for new technology**
 - Costs of renewables have been dropping fast
- **Investments in research and development and infrastructure (e.g., EV charging) can lower future costs**
- **Barrier to expanding renewable energy: intermittency**
 - Battery technology under development



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Geoengineering and Carbon Capture

- **Technical pathways to reduce climate change without reducing emissions**
- **Carbon capture: captures CO₂ emissions and stores them or “utilizes” them (for energy, pressure, etc.)**
 - Not yet proven at scale
- **Solar geoengineering: make the atmosphere reflect more light to regain earlier thermal balance**
 - Totally theoretical
 - Potentially risky



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Climate Change Policy



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43

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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44

44

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.



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**

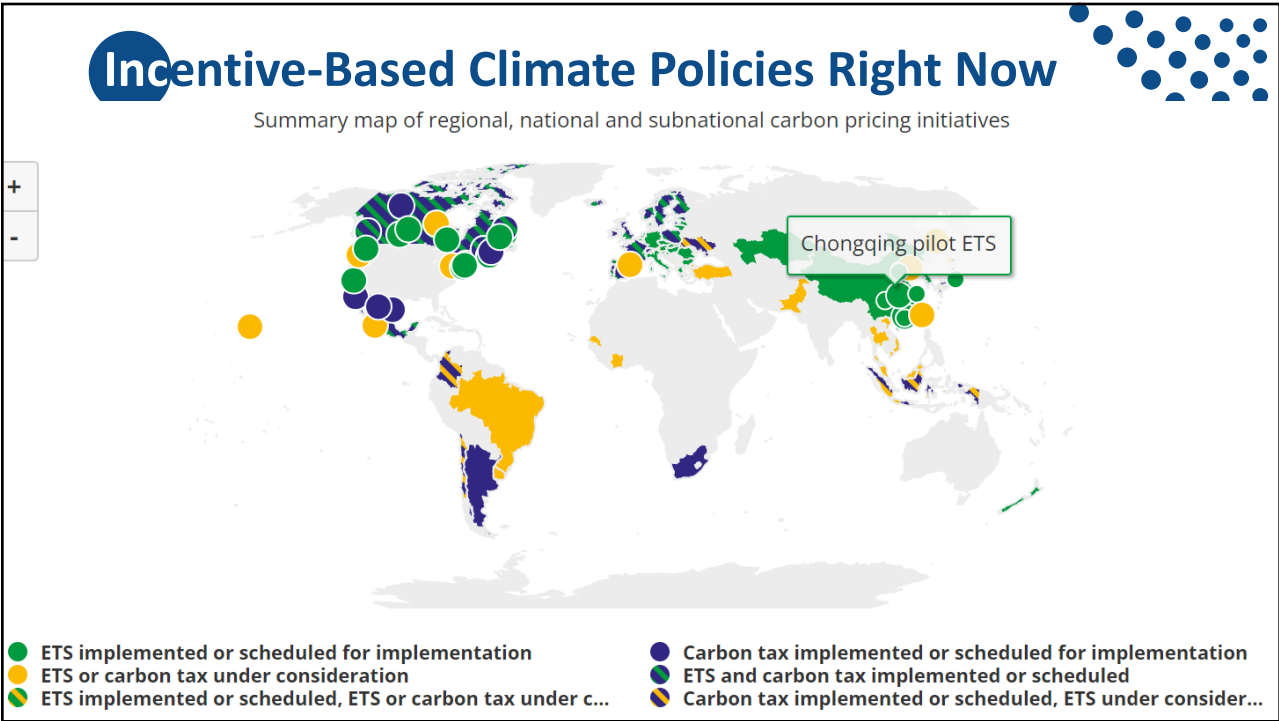
Examples of Other Policies that Reduce Emissions

- 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

Climate Change Policy in Action

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49



50

California's Cap and Trade System Since 2012



0.7%

of global
greenhouse gas
emissions



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51

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

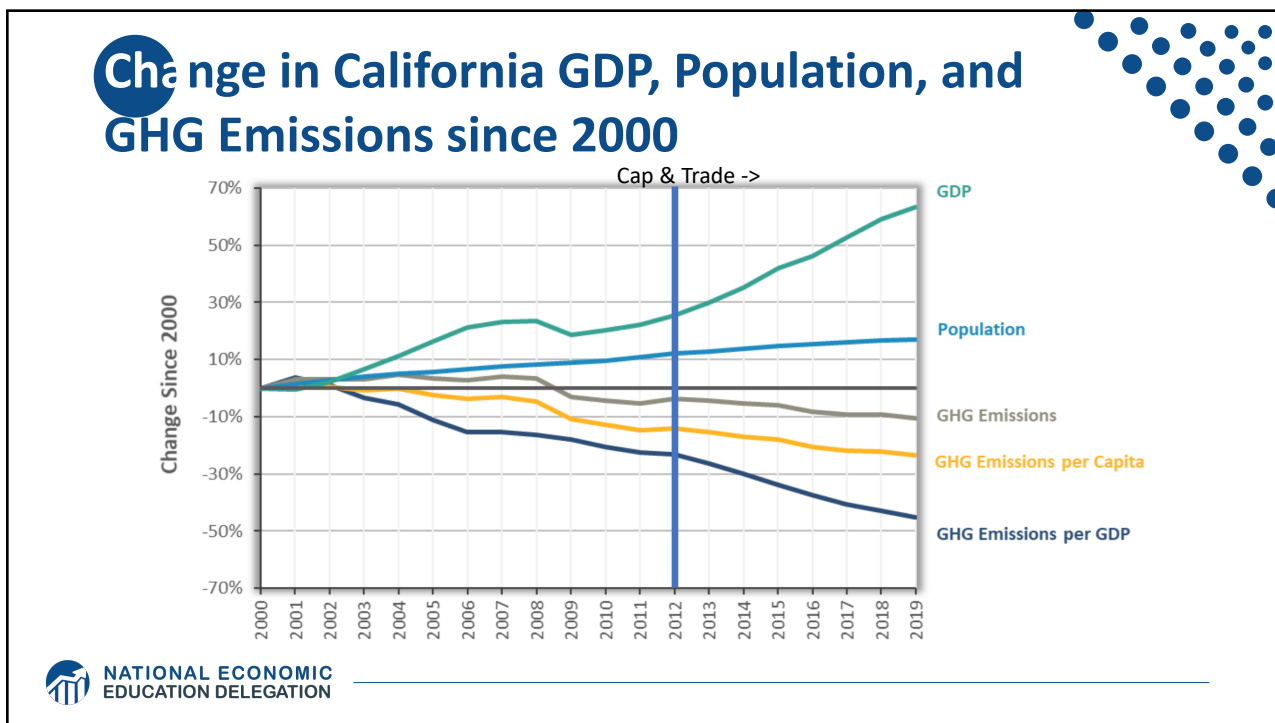
- **California's Tools:**

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

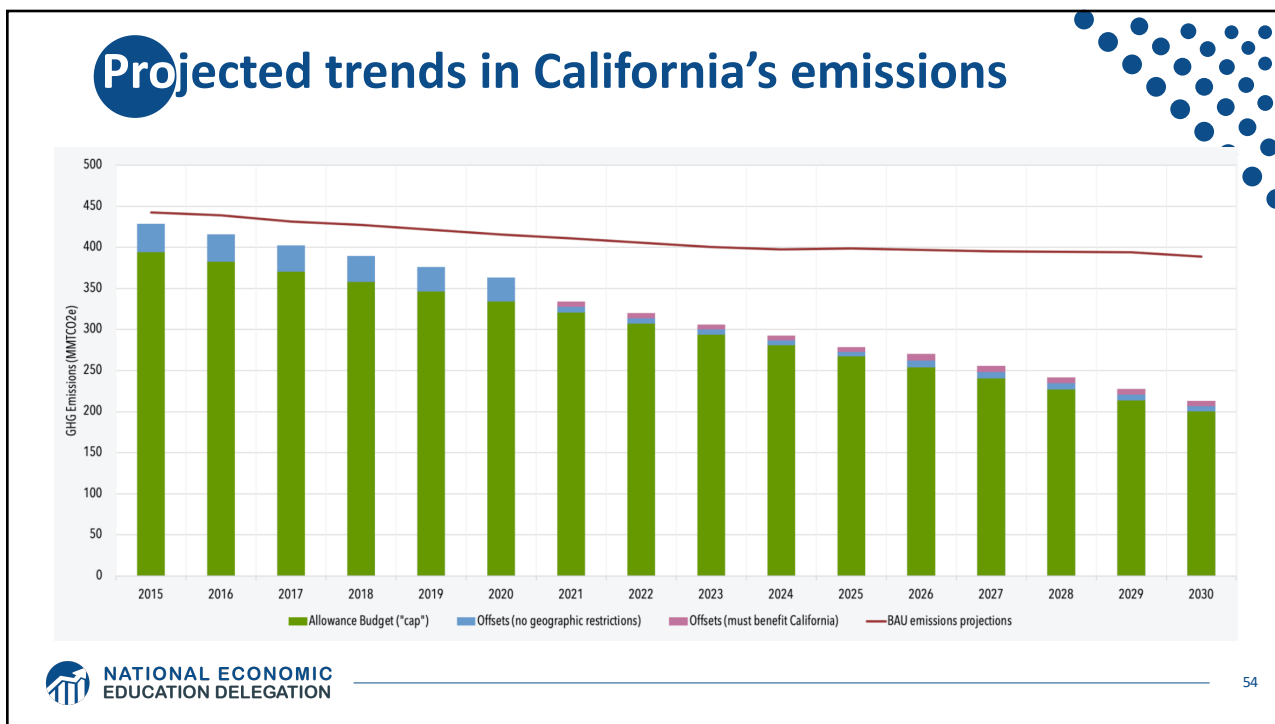


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52



53



54

Summary

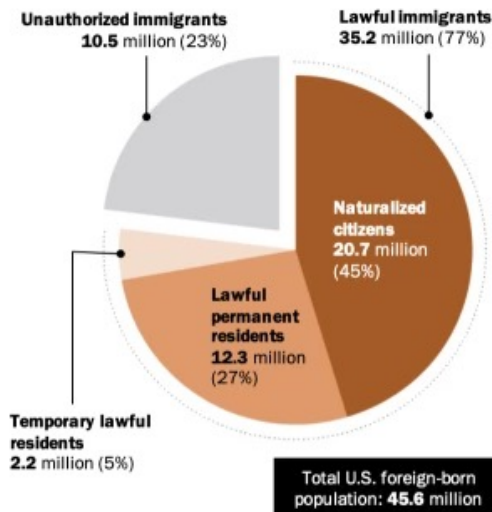
- Climate change is real, is caused by human actions, and has impacts we're already feeling.
- This problem won't solve itself; we need policy intervention, and fast.
- Smart policy can reduce greenhouse gas emissions by the right amount and at the lowest possible cost.
 - For example, cap and trade and emissions taxes!
- We also need policies to help with adaptation and support those bearing the greatest damages.



Immigration: Roger White, Whittier College

Foreign-born population estimates, 2017

Categories of the total number of immigrants in the United States.



<https://www.pewresearch.org/fact-tank/2019/07/12/how-pew-research-center-counts-unauthorized-immigrants-in-us/>

Thank you!

Any Questions?

www.NEEDelegation.org

Trevor O'Grady, Ph.D.

ogradyt@tcnj.edu

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57