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TEXAS LBJ School

# POLICY APPROACHES TO DECARBONIZATION

The good, the bad, and the ugly

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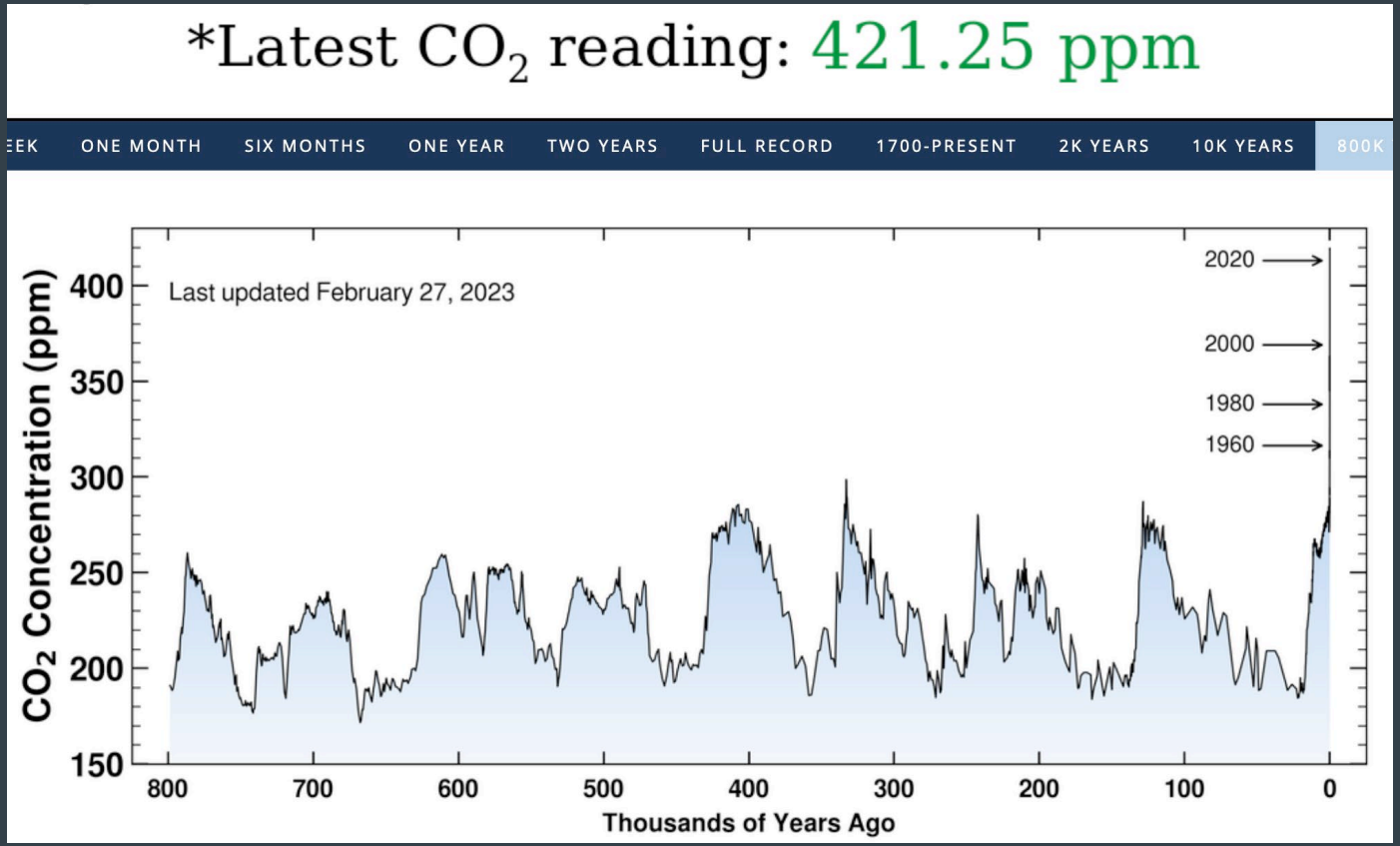
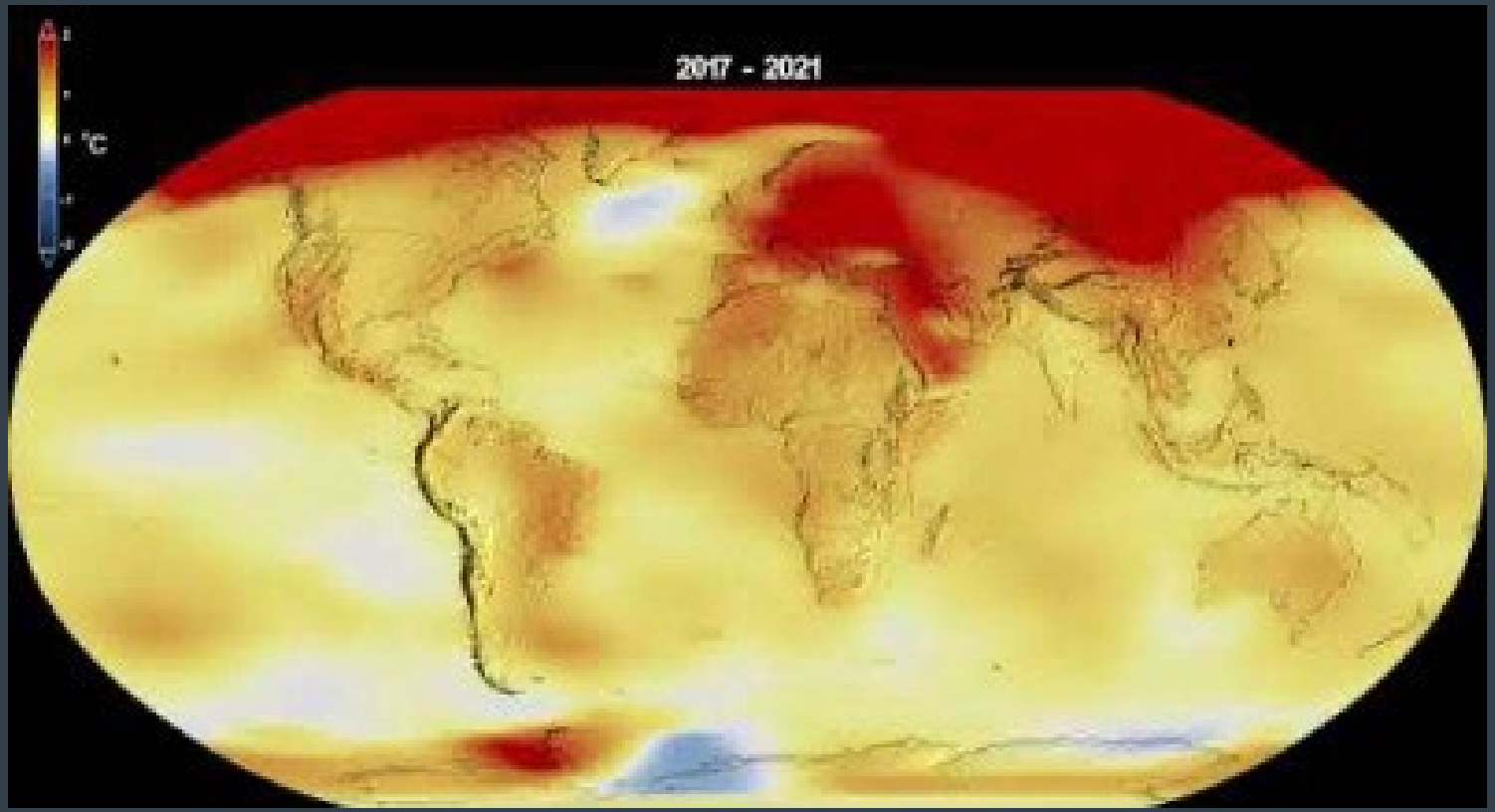


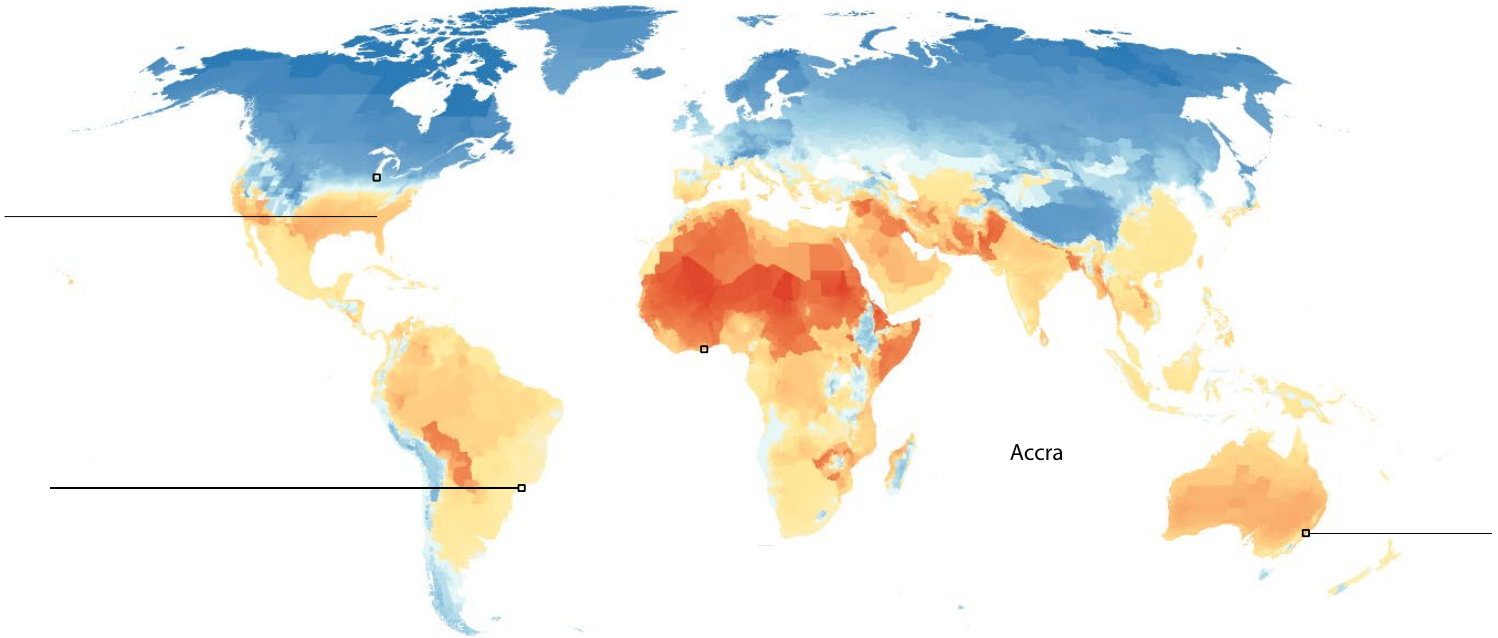

**Source**: Scripps Institute of Oceanography, Mauna Loa Observatory. Available at: https://scripps.ucsd.edu/programs/keelingcurve/. Accessed 27 February 2023.



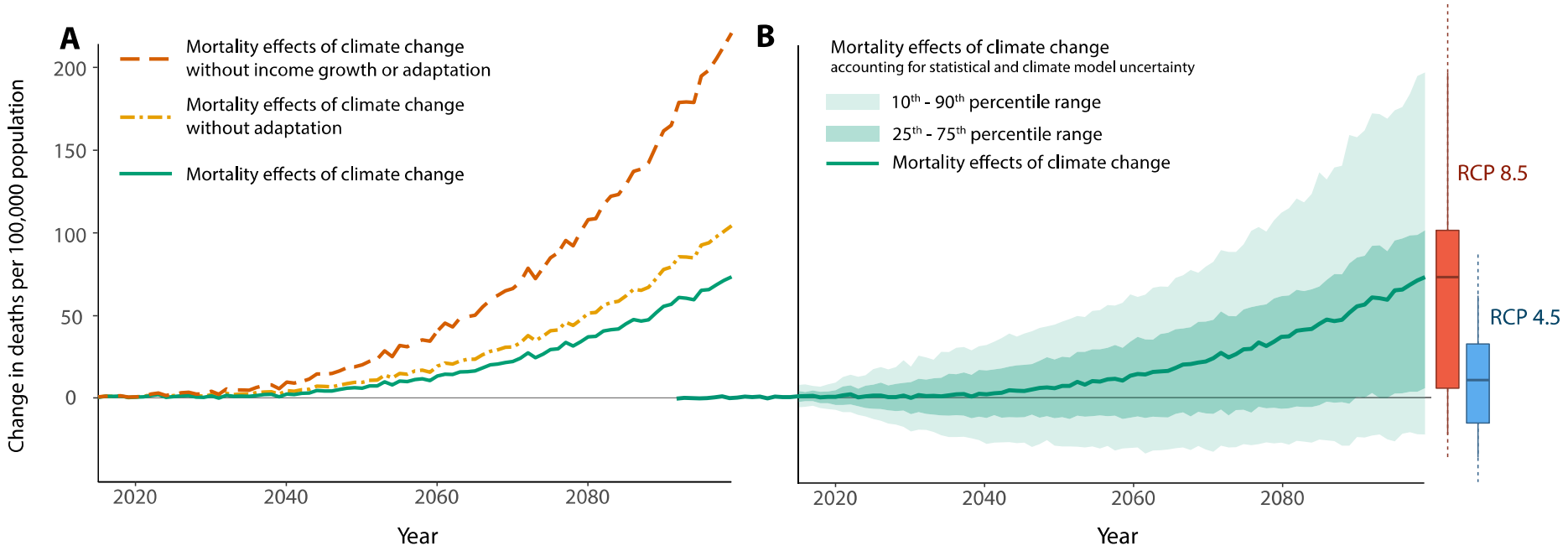

Source: NASA Goddard Space Flight Center. Available at: https://climate.nasa.gov/climate_resources/139/. Accessed 23 March 2022.

# Some economic effects of climate change

- Temperature-related premature mortality
  - Deaths from extreme cold decrease, deaths from extreme heat increase. Impacts of more heat may outweigh impacts of less cold.
- Temperature-related morbidity, learning, reduced labor productivity.
- Agricultural impacts – crops, livestock (positive in some places, negative in others)
- Inundation, coastal damages from sea-level rise, storms
- Changes in energy consumption (e.g., for A/C and heating)
- Changes in water availability (location, timing, etc.)
- Ecosystem impacts
- Human conflict and migration




Source: Carleton, Tamma et al. 2022. Valuing the global mortality consequences of climate change accounting for adaptation costs and benefits. *Quarterly Journal of Economics* 137(4): 2037-2105.

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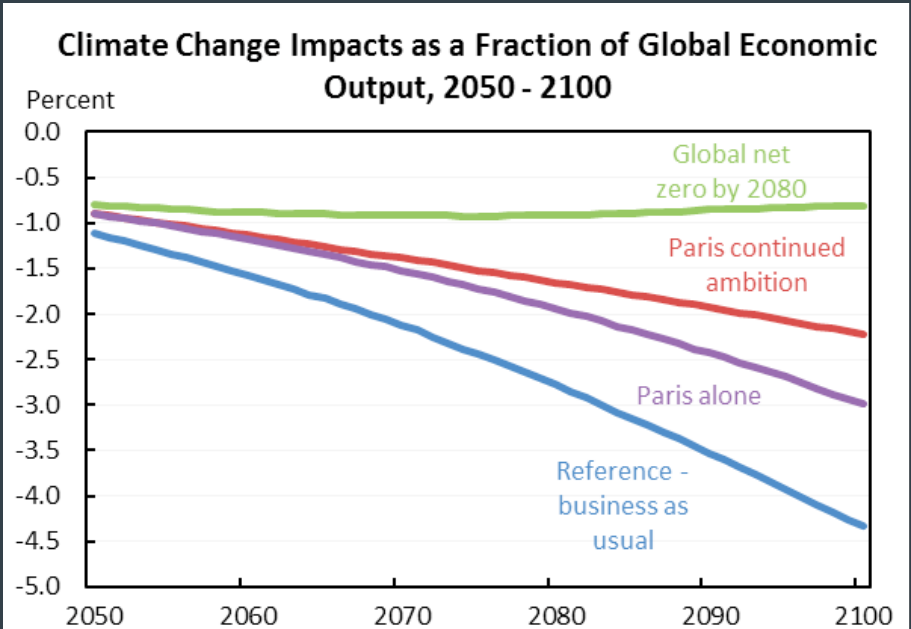
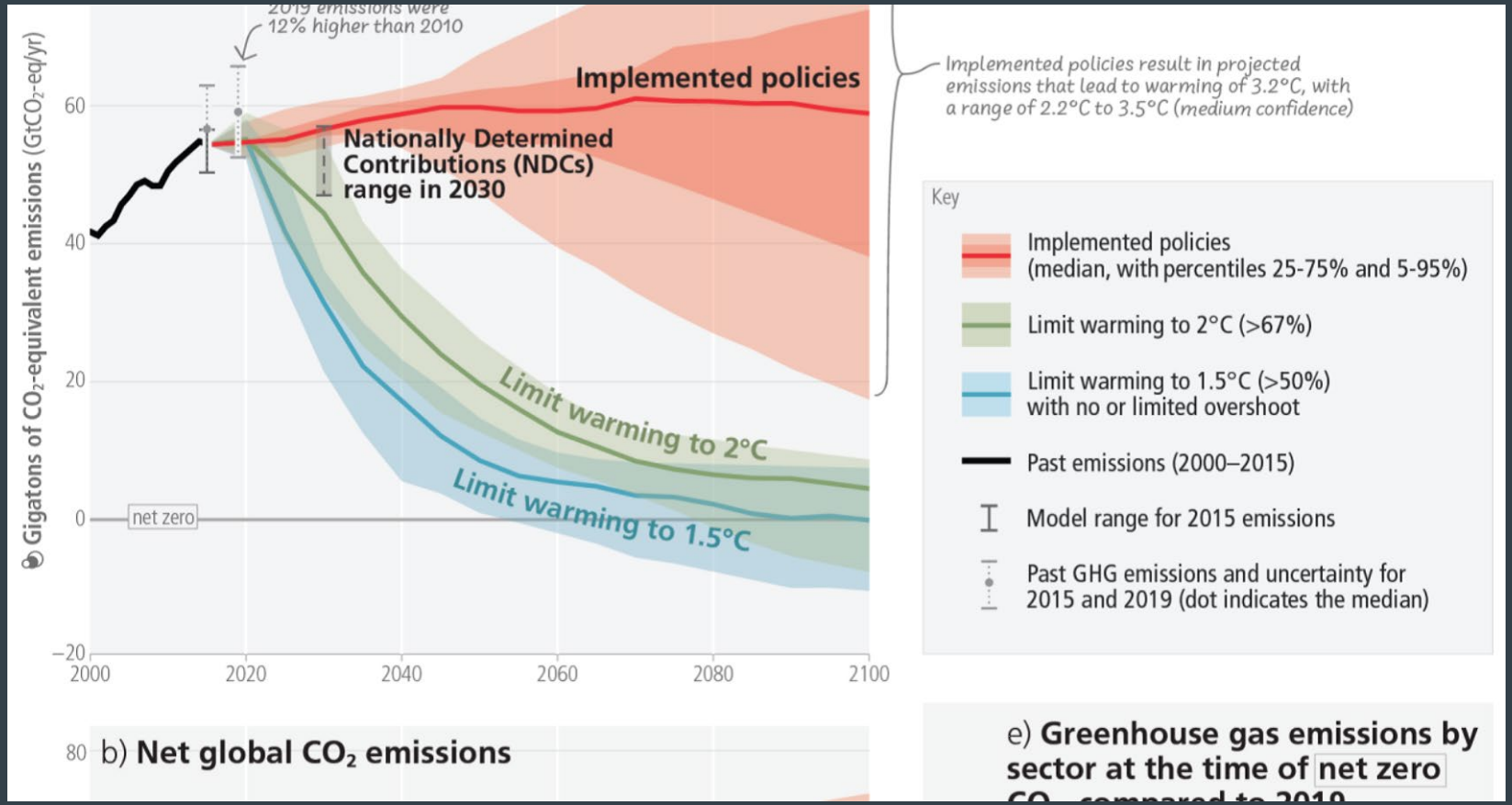
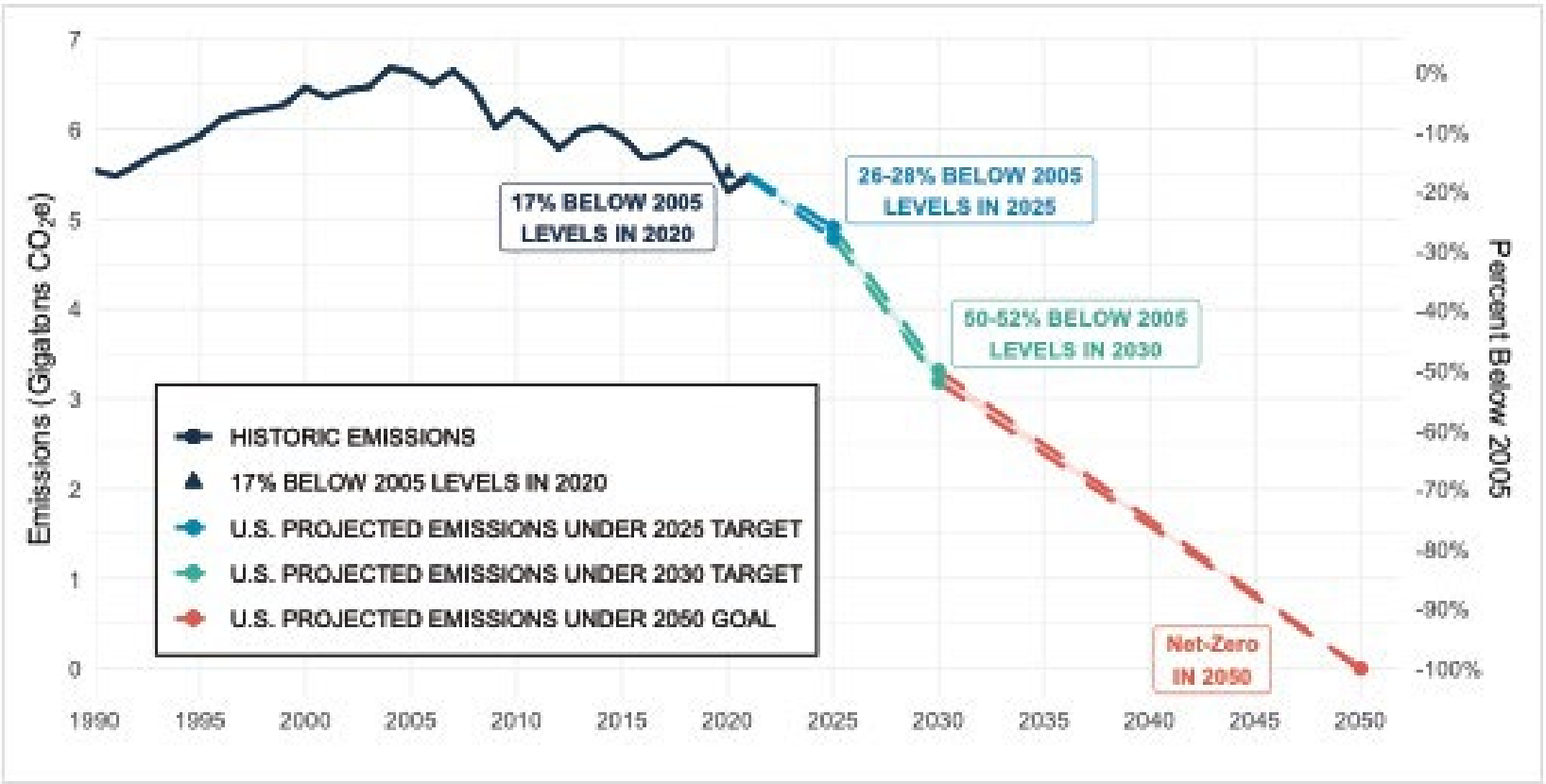



Sources: Fawcett, A. A., et al. Can Paris pledges avert severe climate change? Science 350(6265): 1168-1169 (2015); The White House. United States Mid-Century Strategy for Deep Decarbonization (2016). https://www.whitehouse.gov/sites/default/files/docs/mid_century_strategy_report-final.pdf. Nordhaus, W. DICE-2013R Model, http://aida.wss.yale.edu/~nordhaus/homepage/DICEmodels09302016.htm; CEA, EPA and PNNL calculations.

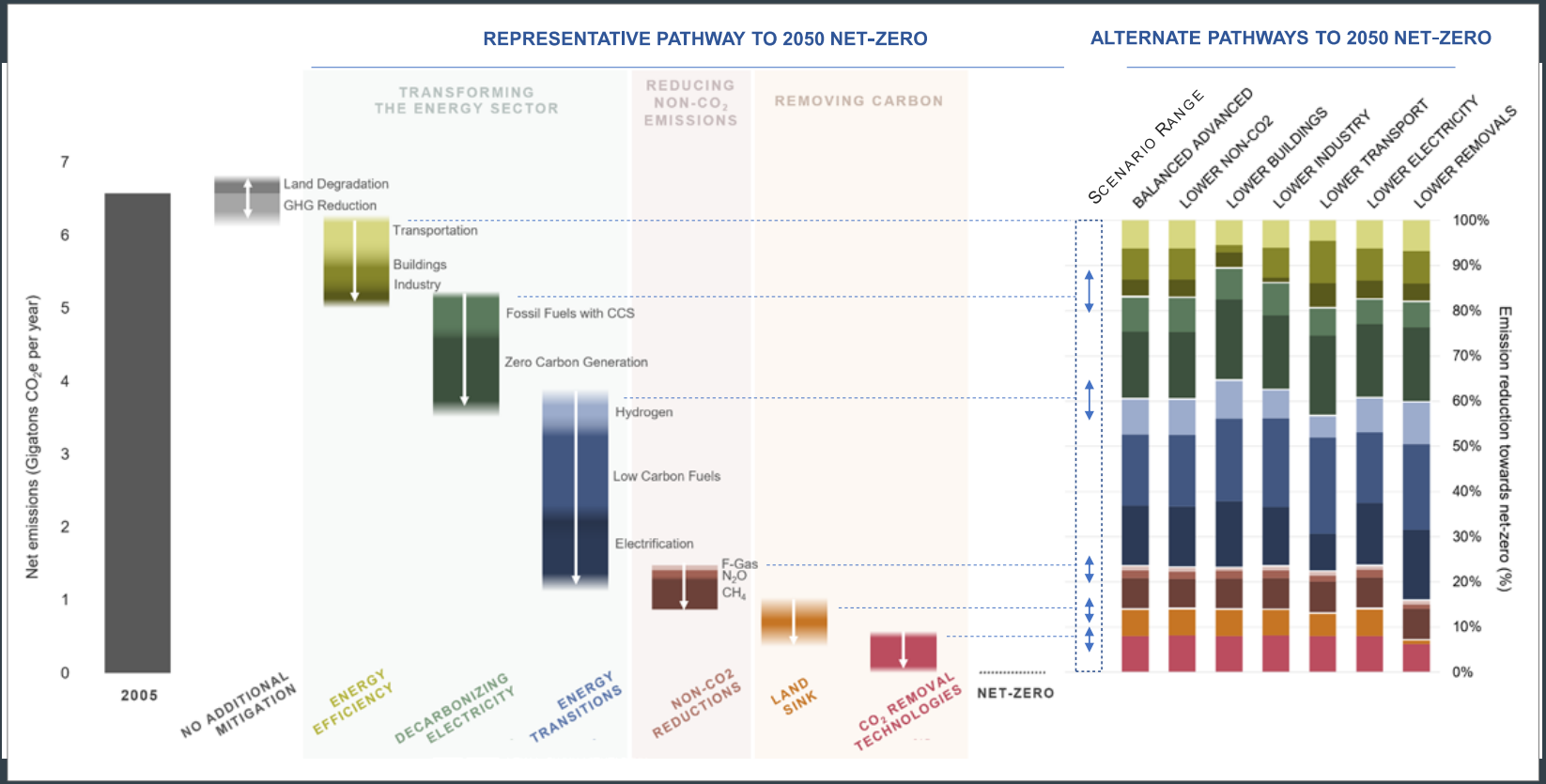
- Climate change generates significant economic damages.
- Converted to GDP impacts, a *very* conservative estimate is that business-as-usual would cost the global economy about 4% of GDP annually by 2100.
- Countries work to characterize and reduce current and future damages through a set of (sometimes) cooperative global institutions.




Lee et al. 2023. AR6 Synthesis Report: Summary for Policymakers. Intergovernmental Panel on Climate Change (IPCC). https://report.ipcc.ch/ar6syr/pdf/IPCC_AR6_SYR_SPM.pdf.




U.S. State Department and Executive Office of the President. 2021. *The long-term strategy of the United States: pathways to net-zero greenhouse gas emissions by 2050*. Washington DC. November.

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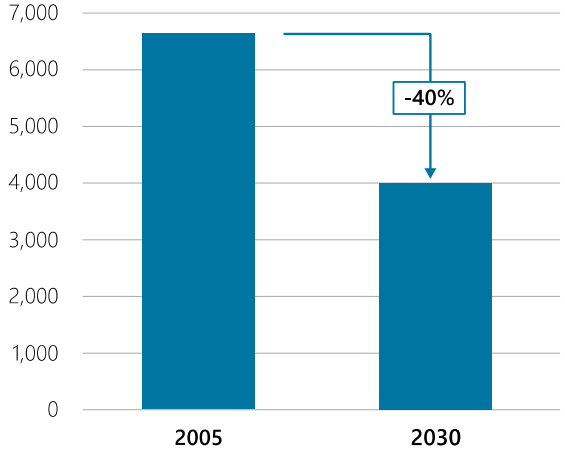
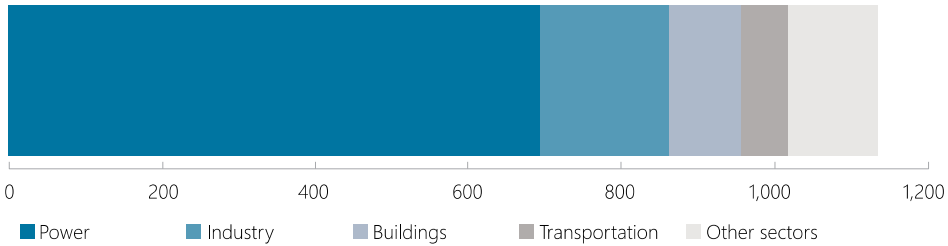
# How to reach mid- and late-century goals?

- Where the private benefits of decarbonization exceed private costs, markets can move us toward these goals.
  - e.g., electricity deregulation + dramatic reductions in the cost of renewable electricity

- Because most benefits of decarbonization are public rather than private, market forces will not get us all the way - leaves a critical role for policy.




Net Economy-wide GHG Emissions Over Time (MMT $CO_2e$)




Estimated Emissions Reductions in 2030 from *Inflation Reduction Act* and *Bipartisan Infrastructure Law* (2030, MMT $CO_2e$)

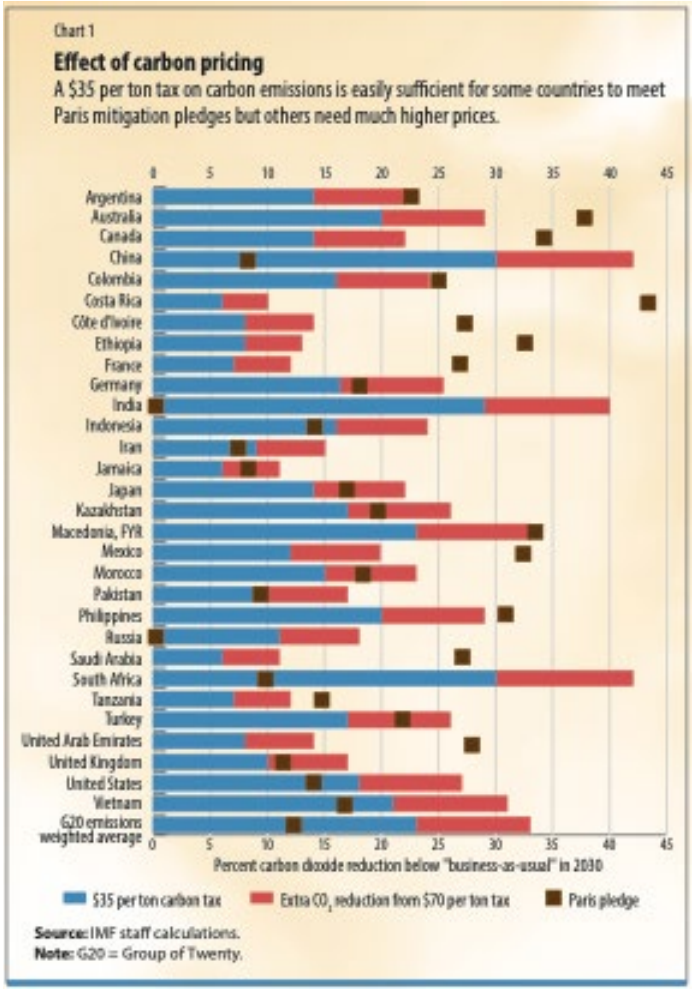
Source: U.S. Department of Energy, Office of Policy. 2022. Inflation Reduction Act Fact Sheet. DOE/OP-0018. Washington, DC. https://www.energy.gov/sites/default/files/2022-08/8.18%20InflationReductionAct_Factsheet_Final.pdf

# What policies, specifically, can we choose?

- Prescriptive or “command-and-control” regulation
  - Technology standards – require use of a specific technology
  - Performance standard – put a ceiling on emissions or the emissions rate.
- Carbon pricing (taxes, cap-and-trade)
- Subsidies (direct payments, tax credits, etc.)

# Selected goals for policy instrument choice

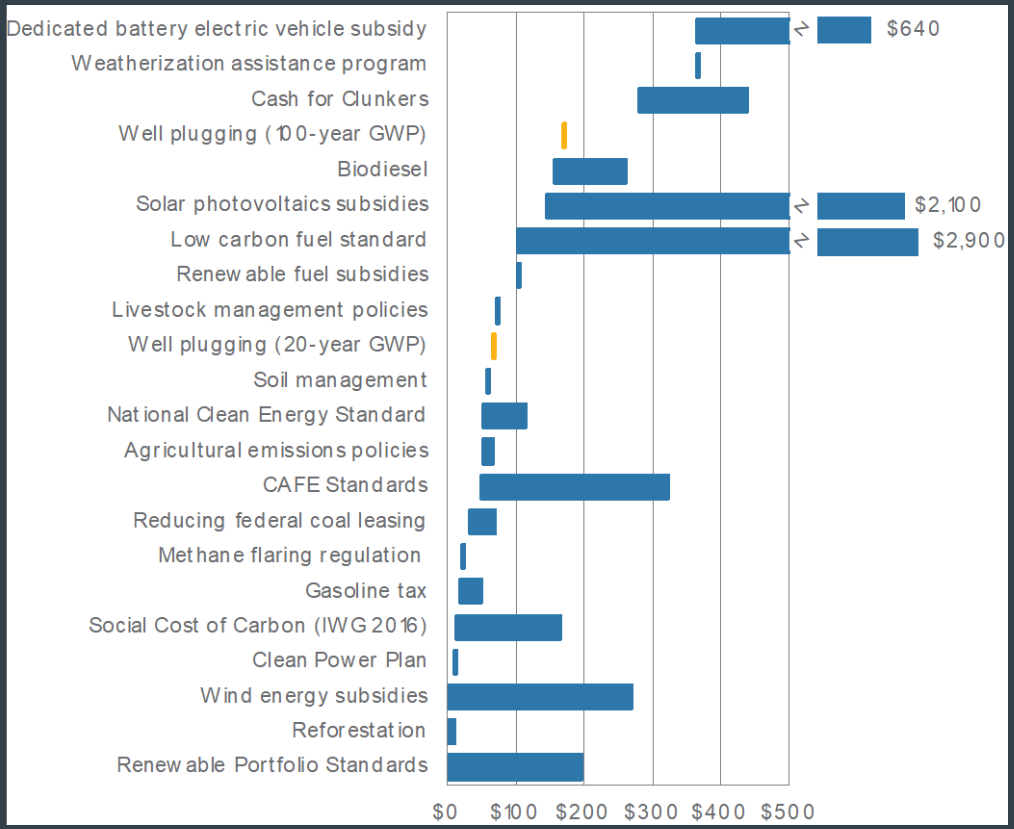
- Effectiveness (ability to meet emissions reduction goal)
- Cost-effectiveness (ability to meet goal as cheaply as possible)
- Incentives for innovation and technological change
- Equitable distribution of costs and benefits
- Political feasibility




- Good news: IMF suggests U.S. could reach its Paris mitigation goal with an economy-wide C tax of $35/ton (Parry 2019).

- Bad news: carbon pricing is a political non-starter in the U.S.

Source: Parry. 2019. Putting a price on pollution. IMF *Finance and Development*, December.




- Price tag ($/ton of $CO_2$) varies widely across the U.S. menu of granular, sector-specific decarbonization policies.
- Compare these to $35/ton

**Source**: Raimi et al. 2020. Green stimulus for oil and gas workers. Columbia CGEP Report, with data from Gillingham & Stock. 2018. The cost of reducing greenhouse gas emissions. *J. Econ. Perspect.* 32(4), p. 59.

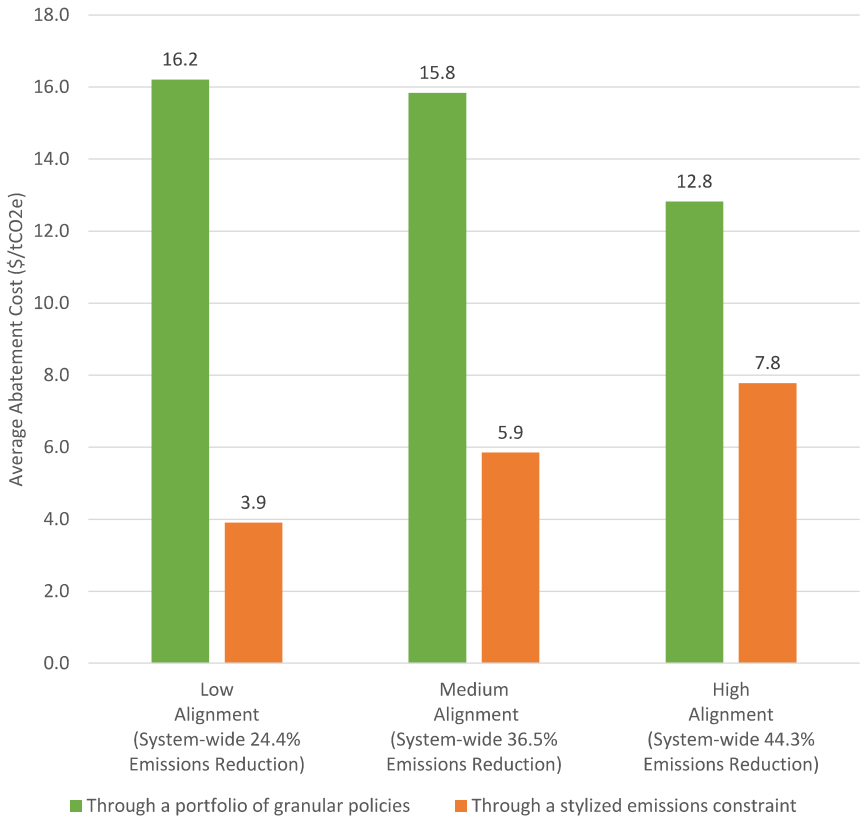


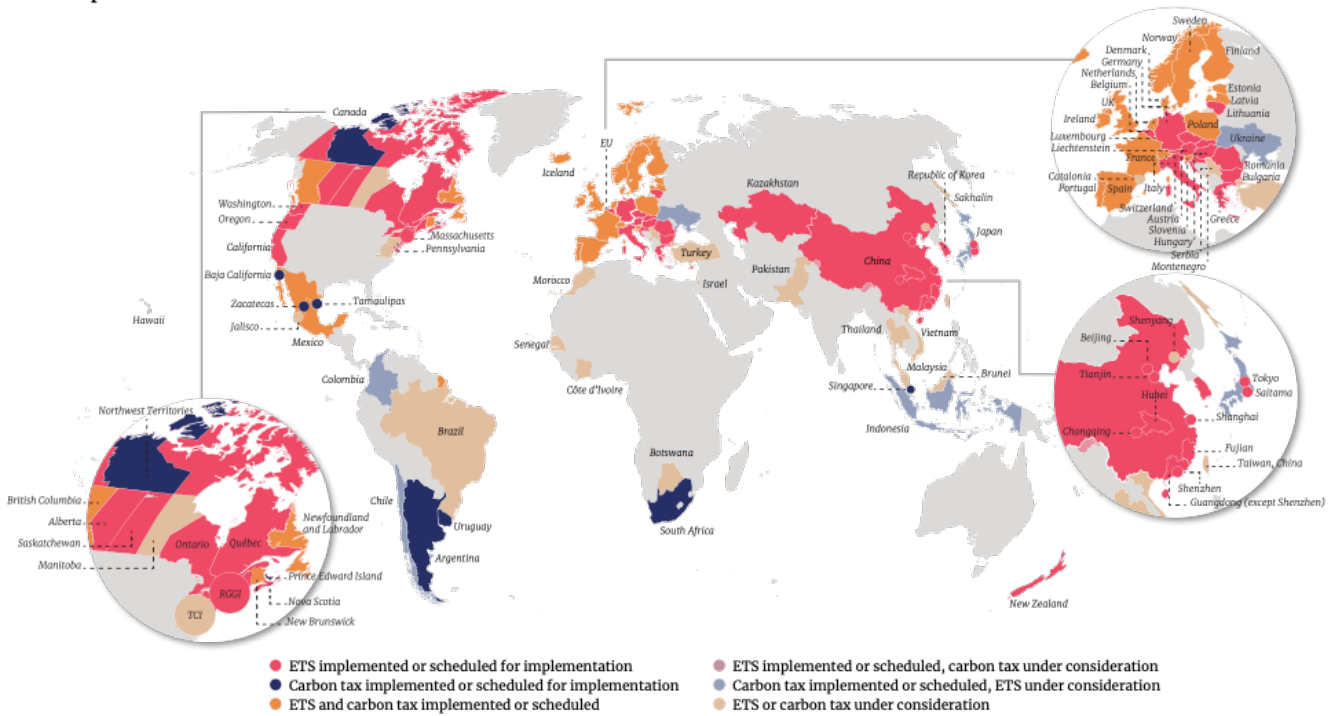

**Fig. 12.** Average abatement cost in various scenarios relative to the BAU scenario.

- Good news: Many decarbonization policies have a relatively low per-ton cost.
- Bad news: Ironically, in the U.S., the *least costly* policies have the *lowest political feasibility*.

Source: Zhu, Q. et al. 2022. Enhancing policy realism in energy system optimization models: politically feasible decarbonization pathways for the United States. *Energy Policy* 161: 112754.

# Globally, carbon pricing is on the move…

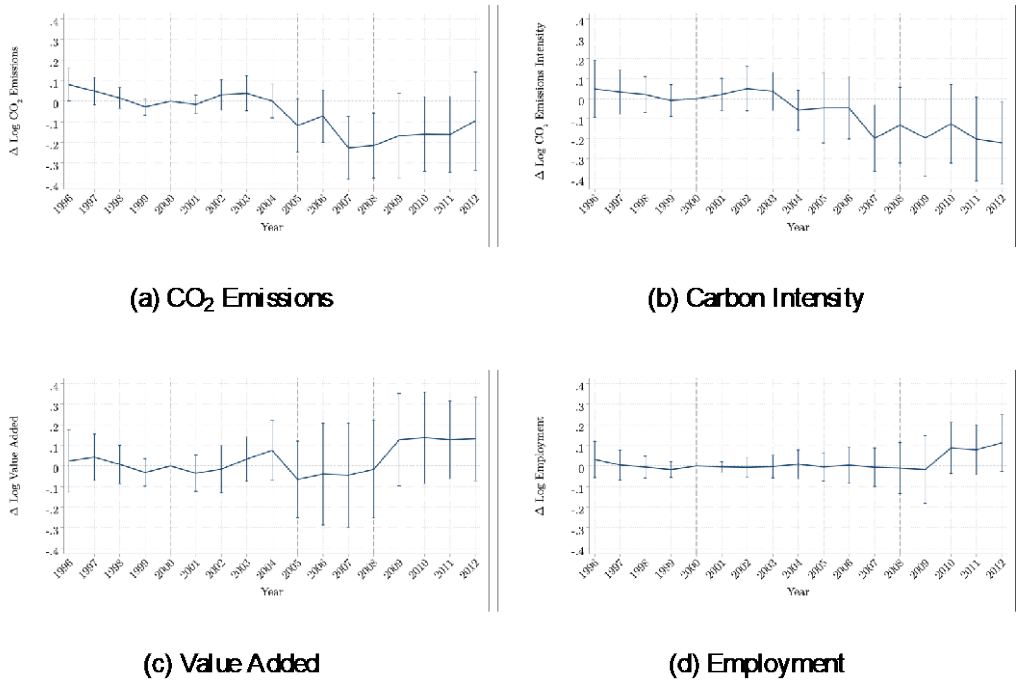
**FIGURE 1**
**Map of carbon taxes and ETSs**




- In 2022, 68 carbon pricing policies in place, 3 on deck.
- Cover ~ 23% of global GHG emissions.
- BUT prices, *on average*, are not high enough to avoid 2C warming.

Source: World Bank, *State and Trends of Carbon Pricing 2022* (Washington, DC: World Bank, 2022).

# Effectiveness of carbon pricing: EU-ETS




Source: Colmer, J. et al. 2020. Does pricing carbon mitigate climate change? Firm-level evidence from the EU Emissions Trading Scheme. Working paper. https://drive.google.com/file/d/1d1CjMvWSMc96Z0ZW75hX9mRqRNN-VWYh/view.

## Estimates of $CO_2$ emissions impacts:

- Reduced by 2-5% in Phase I (Ellerman et al. 2010).
- Reduced by 8% in Phase 2 (Abrell et al. 2011).
- Reduced 3.8%, 2008-2016 (Bayer & Aklin 2020).
- Reduced 14-16% in France, 2005-2012 (Colmer et al. 2020).

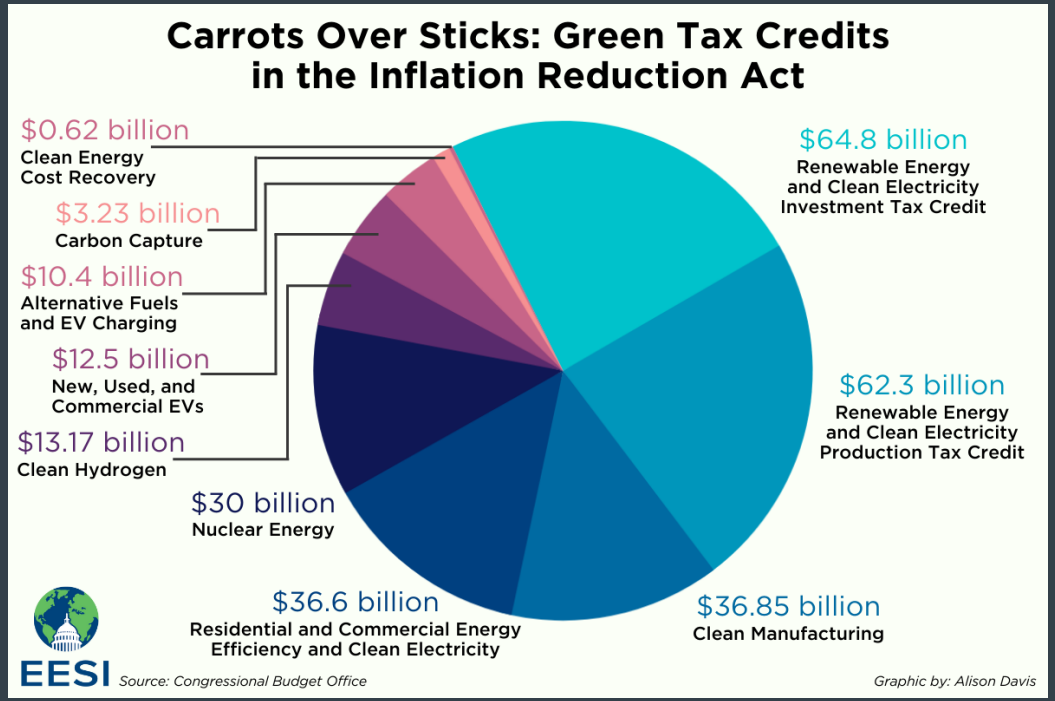
# In contrast, U.S. relies primarily on subsidies

- Since failure to achieve comprehensive carbon pricing in 2010, no viable political path to comprehensive, national carbon pricing.

- Bipartisan Infrastructure Law (2021) and Inflation Reduction Act (2022)
  - As noted earlier, projected to reduce U.S. CO2 emissions ~40% by 2030.
  - Provide new spending and tax breaks toward that goal.

# What's the big deal?

- A carbon price charges firms/households for an economic "bad" (creating emissions that are changing the global climate).
- A decarbonization subsidy pays firms/households for an economic "good" (reducing emissions that are changing the global climate).
- Aren't these two policy instruments "flip sides of the same coin"?




Source: Bertrand, S. 2022. How the Inflation Reduction Act and Bipartisan Infrastructure Law work together to advance climate action. www.eesi.org.

**Good news**: Some subsidies are efficient, whether carbon is priced or not.

**Bad/ugly news**: They can be costly and *potentially* counterproductive.

# When are subsidies a good economic idea?

- Addressing a positive externality
  - R&D (benefits of invention and innovation spill over to other firms)
  - Learning-by-doing (many firms can lower costs when one firm gains experience)
  - Network externalities (e.g., EV charging stations, transmission for renewable electricity, $CO_2$ collection infrastructure for CCUS)
- Addressing information asymmetries and behavioral issues
  - Principal-agent problems (e.g., building energy efficiency for renters)
  - Consumers under-value energy efficiency (?) (e.g., CAFÉ)

See: (Newell et al. 2019)

# Subsidy downsides

- Subsidies for emission reduction can be counter-productive and can even *increase* emissions.

See: (Newell et al. 2019)

# Example: renewable electricity subsidies

- Subsidies to generators of wind and solar electricity can increase the total electricity supply, reducing power prices and increasing consumer demand (Palmer and Burtraw 2005).

- This unintended effect reduces renewables subsidies' capacity to drive down emissions.

# Another example: CCUS subsidies

- Subsidies for carbon capture and storage (tax incentives under 45Q), paid in $/ton, give the biggest payments to firms with highest emissions.
  - Can prevent or delay exit of more polluting firms/plants from the market.

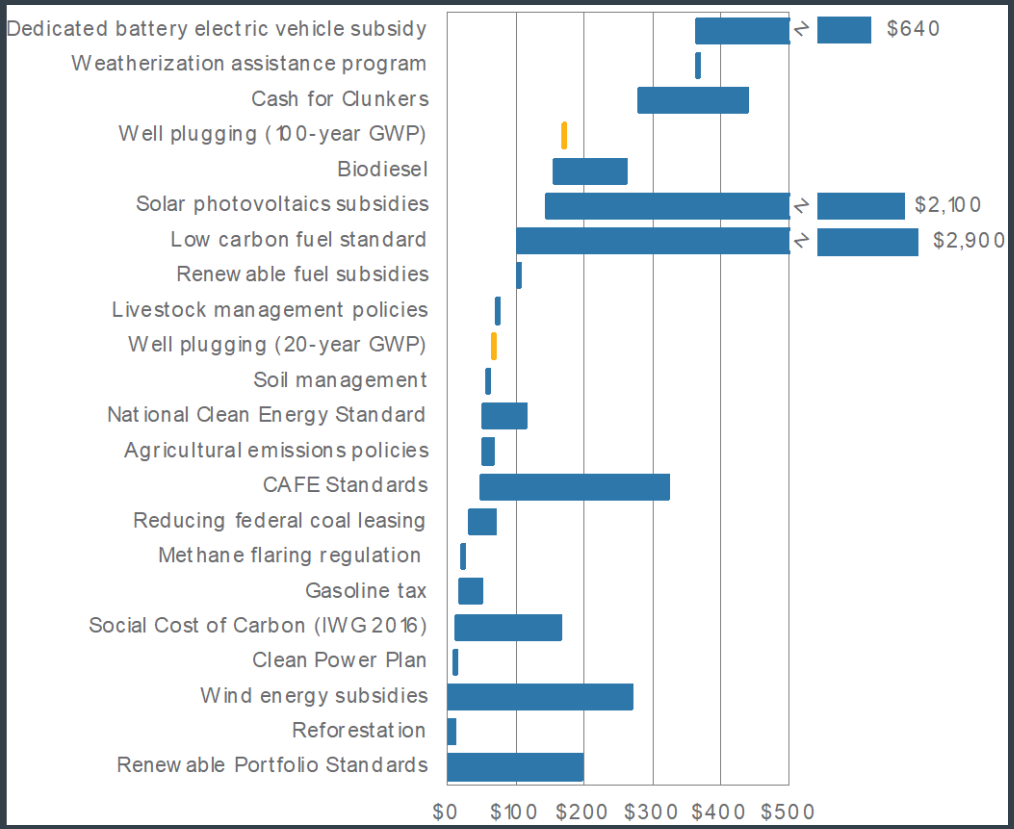
- This unintended effect would reduce CCUS subsidies' capacity to drive down emissions.

# Subsidy downsides

- Subsidies for emission reduction can be counter-productive and can even *increase* emissions.

- Subsidies are inefficiently costly relative to many other policies.

See: (Newell et al. 2019)




- Recall this list of U.S. decarbonization policies - many of the priciest are subsidies.

**Source**: Raimi et al. 2020. Green stimulus for oil and gas workers. Columbia CGEP Report, with data from Gillingham & Stock. 2018. The cost of reducing greenhouse gas emissions. *J. Econ. Perspect.* 32(4), p. 59.

# Subsidy downsides

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- Subsidies are inefficiently costly relative to many other policies.
- Government must “pick winners” to subsidize specific technologies (and long-term govt support for some technologies may lock out others).

See: (Newell et al. 2019)

# “Picking winners”

- Standard critique of industrial policy generally, not just policy aimed at the energy transition.
- If $CO_2$ is priced, the market picks winners, but the government must pay subsidies to specific entities.
- Do governments know enough about where markets are going to invest in the “right” technologies and firms?

# Subsidy downsides

- Subsidies for emission reduction can be counter-productive and can even *increase* emissions.
- Subsidies are inefficiently costly relative to many other policies.
- Government must “pick winners” to subsidize specific technologies (and long-term govt support for some technologies may lock out others).
- Some subsidies go to recipients who would have deployed technology even without help.

See: (Newell et al. 2019)

# Example: Cash for Clunkers

Popular - $2.85 bn for almost 700,000 transactions in < one month.

About 45% of funds went to consumers who would have replaced a vehicle even w/o the subsidy (Li et al. 2013).

- Changed the timing, rather than just the incidence, of vehicle trade-ins.

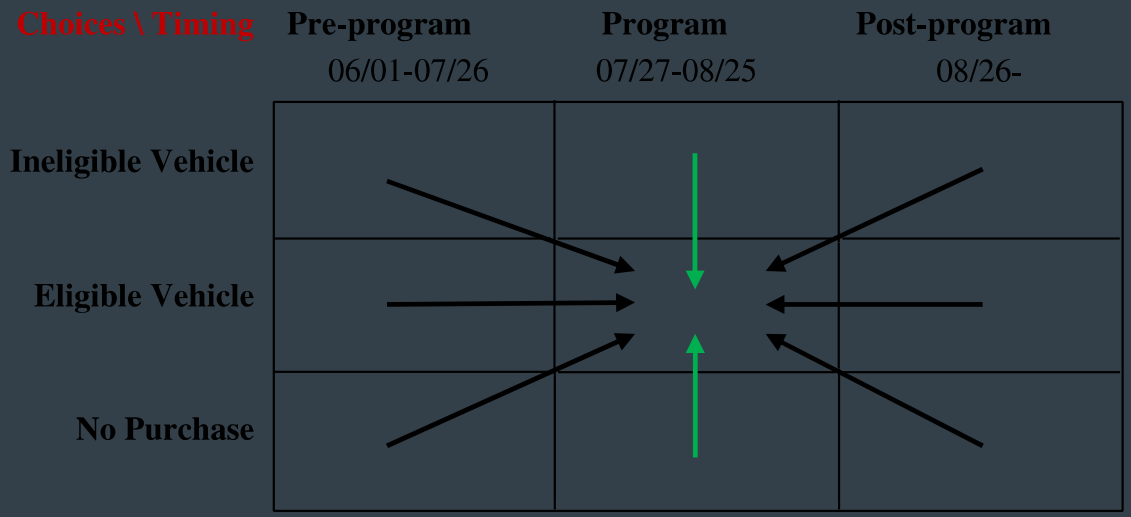


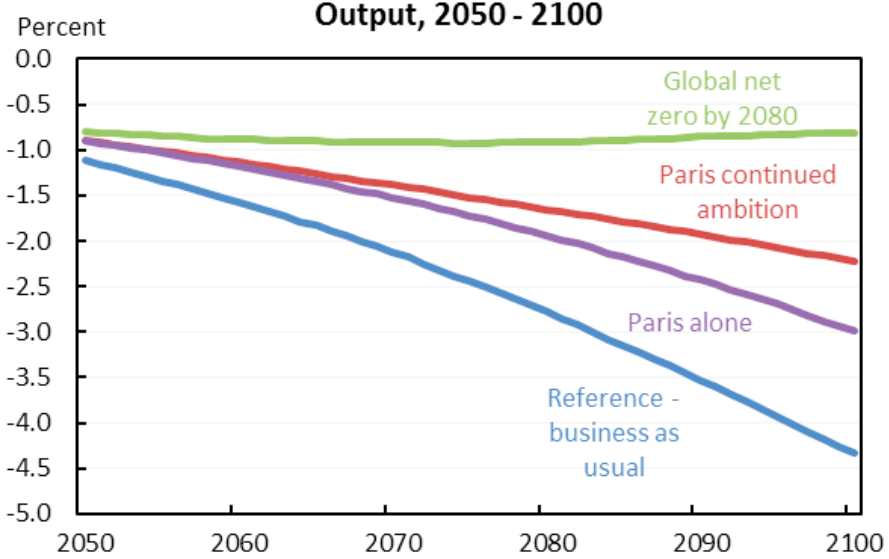

**Fig. 2.** Diagram of Program effects.

Source: Li, S., J. Linn, E. Spiller. 2013. Evaluating "Cash-for-Clunkers": Program effects on auto sales and the environment. J. Environ. Econ. Manage. 65: 175-193.

# Policies for the politics we've got

- Remember, BAU is not free! Climate change is and will continue to be very costly.

## Climate Change Impacts as a Fraction of Global Economic Output, 2050 - 2100

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# Policies for the politics we've got

- Remember, BAU is not free! Climate change is and will continue to be very costly.
- Markets, alone, can't meet this challenge.
- Many of our major trading partners (EU, Canada, China) are deploying carbon pricing.
- U.S. has doubled down, instead, on subsidies.

# Policies for the politics we've got, cont.

- **The good**: comprehensive climate legislation (some of it bipartisan!) is targeted to reduce U.S. $CO_2$ emissions 40% by 2030.

- **The bad**: This is going to be more expensive than it needs to be.

- **The ugly**: Granular, sector-specific policies like these are tough to model and have few precedents on such a large scale.
  - Effectiveness in reducing emissions, minimizing unintended consequences depend critically on robust evaluation (prospective modeling, retrospective empirical evaluation).