

# Toward a True Cost of Climate Pollution

## How Vermont Can Better Incorporate the Latest Research on the Social Costs of Greenhouse Gases

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# About Me





# Project Purpose

Research and write a report that explains the social costs of greenhouse gases (SC-GHG), key considerations related to the estimation of the SC-GHG, and its relevant implications for Vermont, in anticipation of 2025 Climate Action Plan revisions



# Research Scope and Methodology

- Research updated estimates of the social costs of greenhouse gases and determine how previous estimates are currently being used in Vermont
- **Resources:** Interviews with leading national experts and state government professionals, academic articles, reports prepared for the Vermont Climate Council, US EPA reports



# Key Questions

- Conceptually, what are the social costs of greenhouse gases?
- How are SC-GHG estimated?
- Why are SC-GHG important?
- What are the estimated values?
- How are the SC-GHG currently being used in Vermont?
- What are the implications for Vermont moving forward, given the most recent national research?



- **Problem:** Costs and benefits of reducing greenhouse gas emissions need to be described in the same units.



- **Solution:** Quantify (in today's dollars) the benefits of reducing greenhouse gas emissions by a specific amount in a given year.



## Definition (cont.)

“An estimate, in dollars, of the present discounted value of the future damage caused by a metric ton increase in carbon dioxide (CO<sub>2</sub>) emissions into the atmosphere in that year

or, equivalently, the benefits of reducing CO<sub>2</sub> emissions by the same amount in that year”

*(National Academies of Sciences, Engineering, and Medicine)*



# Timeline

<b>2008</b>	President Obama forms Interagency Working Group on the Social Cost of Carbon
<b>2016</b>	Recommendations released from the National Academies on recommended updates
<b>2017</b>	President Trump disbands the IWG on Social Cost of Carbon
<b>2021</b>	President Biden's Interagency Working Group forms, using interim values based on 2016 estimates Estimates prepared by Resources for the Future for NY State
<b>2022</b>	RFF-Berkeley: "Comprehensive evidence implies a higher social cost of CO <sub>2</sub> "  EPA peer review for: "Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances"





# Two Complementary Approaches

## Marginal Abatement Costs

the cost of abating the last metric ton of carbon dioxide needed to meet a particular emissions target at least cost to society

- marginal cost (or savings) of action
- Based on emissions targets

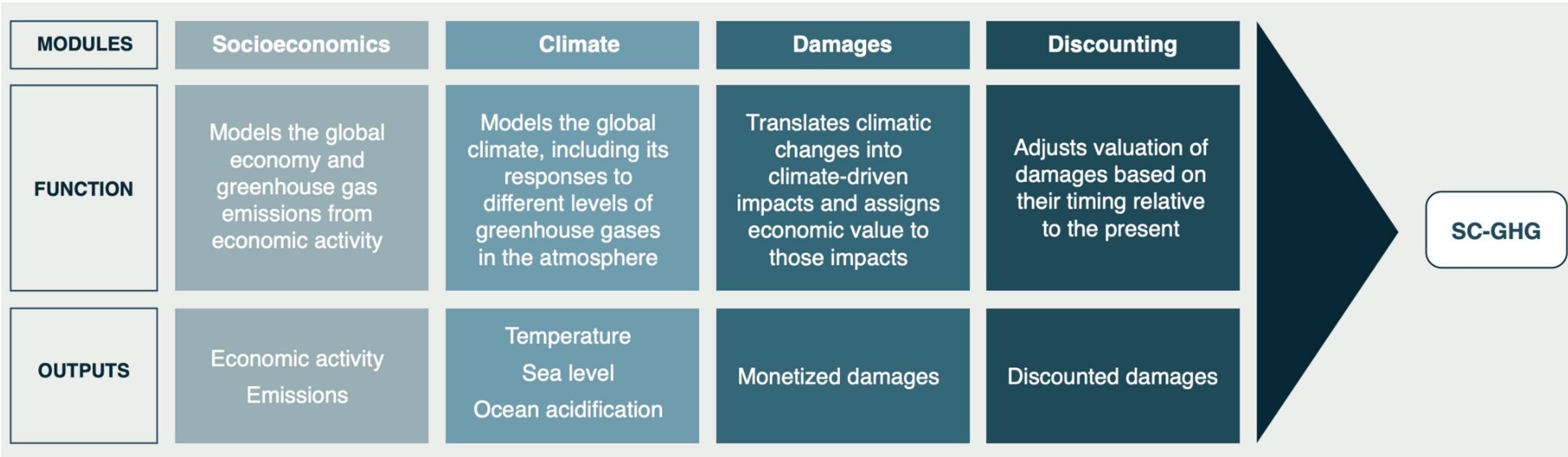
## Marginal Damages

the cost of emitting an additional metric tonne of carbon dioxide into the atmosphere in a given year

- marginal cost of **in**action
- Based on climate system models and damage functions



# Integrated Assessment Models



**Source:** The Social Cost of Greenhouse Gases: a Guide for State Officials, Institute for Policy Integrity, NYU School of Law, 2022; [Web Link](#)



# Marginal Damages Approach: Assumptions

Modeling choices affect the outcome of Integrated Assessment Models:

- **Discount rate:** Relative to today, how much does society care about future dollars?
  - The choice of a discount rate is a question of economics and moral philosophy.
  - Higher discount rate → lower estimate of social costs of greenhouse gases
- **Uncertain model components:**
  - Global carbon dioxide, methane, and nitrous oxide trajectories; Country-level GDP projections; BRICK sea-level model, among others



## Marginal Damages Approach: Assumptions (cont.)

- **Damage modules:**
  - **RFF-Berkeley:** GIVE adds together damages from health, agriculture, energy, and coastal impacts
  - **EPA:** In addition to GIVE, EPA uses a sectoral damage function from DSCIM and a meta-analysis based damage function from Howard and Sterner (2017), and averages the outcomes of all 3 models



## Global vs. Local Damages:

- Equity weights
  - Not yet incorporated into leading Integrated Assessment Models
  - Should there be a 'weight' given to the social costs of greenhouse gases based on what region is receiving the damages?
  - Should different states, regions, or nations use different costs for greenhouse gas emissions?



# Equity Considerations (cont.)

## **Intergenerational Equity:**

- Is it equitable to place lesser value (discount) on costs to future generations?
- Future costs that will be borne by human beings that do not yet exist



## Initial Vermont Climate Action Plan (2021)

- Global damages-based estimation
- \$121/metric tonne for a pulse of CO2 emissions in 2020
- 2% discount rate
- Additional analyses with 1% and 3% discount rates
- Plan for updated research



# Uses of SC-GHG in Vermont

## Agency of Natural Resources (ANR)

In describing the **environmental and economic benefits** of proposed rules, ANR calculated:

- 2026-2040 Statewide Estimated Avoided Social Cost of CO2 from Advanced Clean Cars II vehicle rules
- 2025-2050 Statewide Estimated Avoided Social Cost of CO2 from Medium- and Heavy-duty vehicle rules.

## Public Service Department (PSD)

SC-GHG was used in a proceeding regulating Vermont Gas System's (VGS) purchase of renewable natural gas contracts at the Seneca Meadows Landfill in Waterloo, New York.

To assess the **cost-effectiveness** of the proposed contract, the Department considered the price of the contract relative to the benefits of the contract, including the value of the estimated emissions reductions relative to fossil gas.





# Uses of SC-GHG in Vermont

## Efficiency Vermont

Uses SC-GHG as part of its societal cost-effectiveness testing for energy efficiency programs they deliver.

When evaluating cost-effectiveness, Efficiency Vermont includes various groupings of benefits:

- Energy savings – such as electric (kWh, kW) and thermal (MMBtu) savings
- **Greenhouse gas avoided externality costs**
- Non-energy benefits (such as comfort, improved health, and resiliency benefits)



# Values of the Social Cost of Carbon Dioxide

Damage Function	Near-term Discount Rate			
	1.5%	2%	2.5%	3%
DSCIM, Howard & Sterner, and GIVE; Outcomes averaged, unrounded. (EPA)  *Under peer review.	\$337	<b>\$193*</b>	\$117	Not available
GIVE sectoral (RFF-Berkeley)	\$308	<b>\$185</b>	\$118	\$80



# Implications for Vermont

- 1) The value for the social costs of carbon dioxide used during development of the Vermont Climate Action Plan (referred to as the “social cost of carbon” in the CAP) was \$121/metric tonne to describe the impacts of a pulse of emissions in 2020. This value was based on the best available information at the time. Since then, RFF-Berkeley has estimated the social cost of CO<sub>2</sub> to be **\$185/metric tonne**, and the EPA has developed an estimate of **\$190/metric tonne**.



## Implications for Vermont (cont.)

2) In the 2021 Vermont CAP, the Vermont Climate Council **committed to revising** the Social Cost of Greenhouse Gases used during development of the 2021 CAP as new research and analysis become available. The development phase of the upcoming 2025 Vermont CAP will be a key time to do so.



# Implications for Vermont (cont.)

3) The estimates by RFF-Berkeley and the EPA are **likely to underestimate** the true social cost of greenhouse gases, since their damages modules lack impacts on morbidity and biodiversity, among others. Researchers continue to update and add to the available models, as work continues on this important topic.



**Thank you!**

Questions and Comments?

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