



An Analysis of Decarbonization Methods in Vermont Transportation

Marc Hafstead and Wesley Look

Montpelier, VT

January 2019

An Analysis of Decarbonization Methods in Vermont

As requested by the Vermont General Assembly in Act 11 (June 2018), this report provides information on policies to reduce greenhouse gas (GHG) emissions in Vermont

Our study aims to inform the policy dialogue, but it is not intended to address the complete universe of policy options.

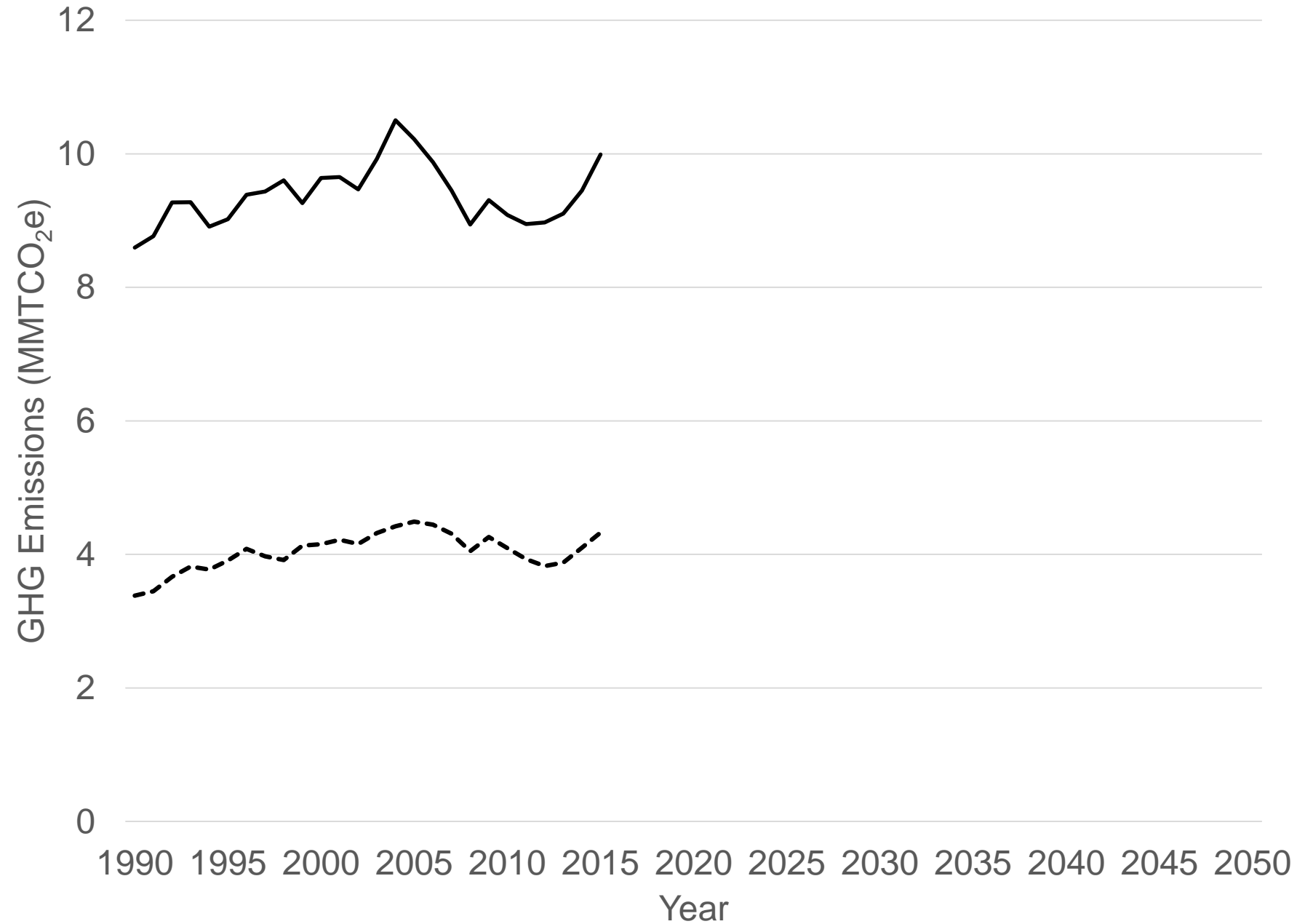
We do not offer specific policy recommendations.

About Resources For the Future (RFF)



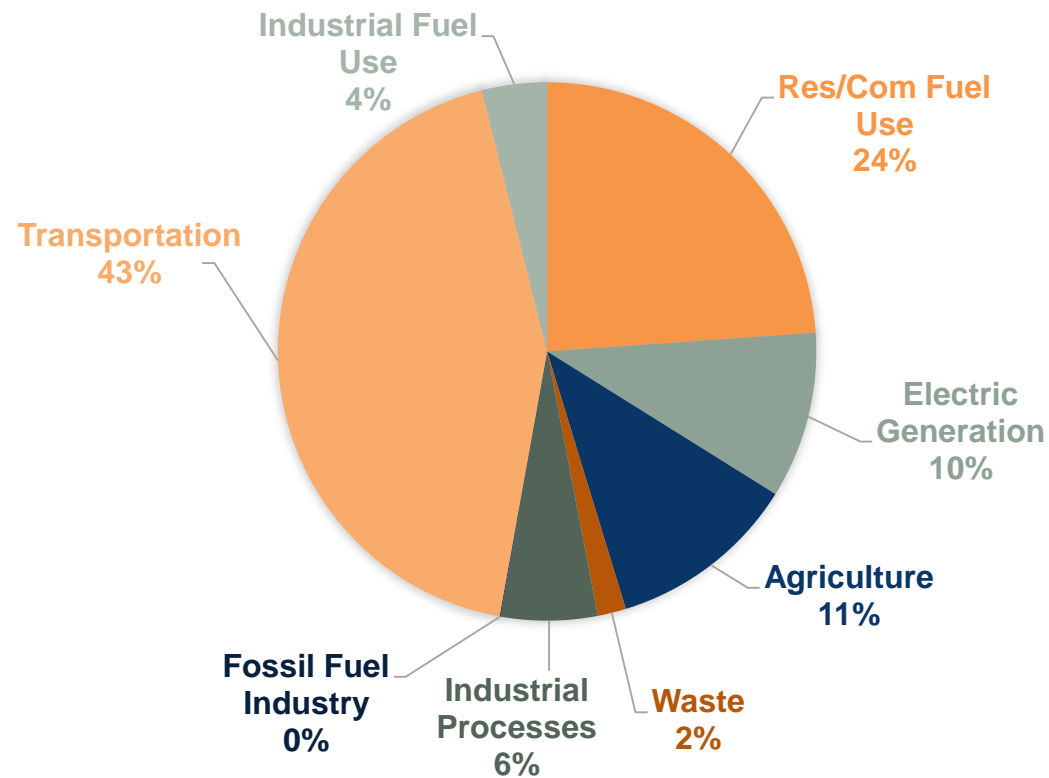
Resources for the Future (RFF) is an independent, nonprofit research institution in Washington, DC. Its mission is to improve environmental, energy, and natural resource decisions through impartial economic research and policy engagement. RFF is committed to being the most widely trusted source of research insights and policy solutions leading to a healthy environment and a thriving economy.

Total and transportation GHG emissions in Vermont

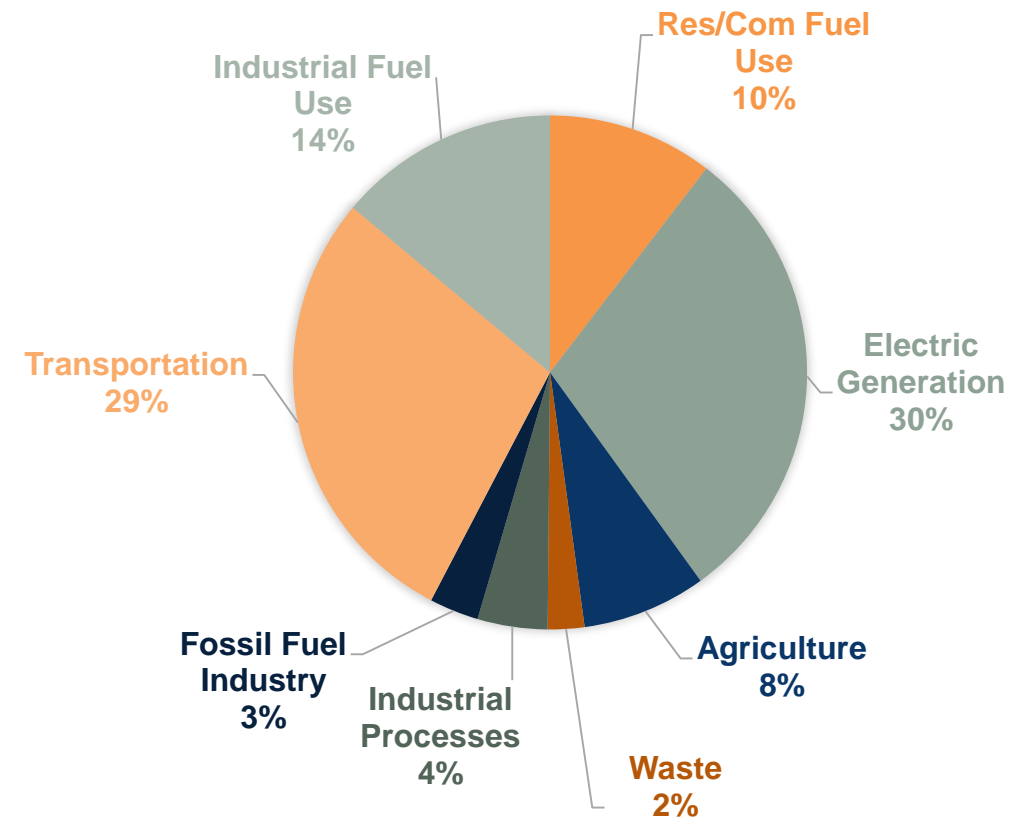


Transportation emissions are a larger share of the total in VT, than the nation

VERMONT GHG EMISSIONS



U.S. GHG EMISSIONS



...therefore the transportation sector has a crucial role in achieving Vermont's climate goals.

Policy Options Considered in this Report

- Carbon Pricing Policies
 - Carbon Tax or Cap-and-Trade Programs
 - A **quantitative** analysis of costs and benefits across a range of policy designs
- Nonpricing Policies
 - Including, but not limited to, Electric vehicle (EV) incentives, public transit and school bus conversions from diesel to electric, and programs to encourage more walking and biking to school and work.
 - A **qualitative** review of emission reduction potential of Vermont Climate Action Commission (VCAC) recommendations and 100 percent Renewable Energy Standard

Some specific transportation policies from VCAC report

Light-Duty Vehicle Policies

- Provide a state-funded or state-facilitated EV purchase incentive
- Invest in electric vehicle charging infrastructure
- Leverage and enhance Drive Electric Vermont (DEV) to maximize the impact of education and outreach campaigns

Heavy-Duty Vehicle Policies

- Use VW settlement funds to jump-start a transition from diesel to electric transit and school buses
- Use grant funding and finance strategies to help overcome the high up-front costs of electric transit buses

Transportation Mode Shifting Policies

- Increase use of public transit in Vermont with more public transit infrastructure, trip planning tools, and enhanced service with more efficient vehicles and routes
- Increase efficiency of school transportation, and promote active transportation to school
- Increase programs and public infrastructure to support walking and biking in Vermont
- Implement programs and policies to increase multimodal transportation

Three overarching ways to reduce transportation emissions

- Increase fleet fuel efficiency
 - Includes joining the California vehicle fuel-efficiency program (which VT is part of)
- Reduce personal Vehicle Miles Traveled (VMT)
 - Includes shifts to walking and biking, telecommuting, public transit, the development of local economies that limit the need to travel for goods and services
- Fuel switching
 - Includes increasing use of electricity (electric vehicles), biodiesel, ethanol, hydrogen

Key Finding: Carbon pricing-only unlikely to meet US Climate Alliance targets (26-28% below 2005)

Projected GHG emissions in 2025 relative to 2005				
	Carbon Price Policy			
	TCI	WCI	ESSEX	High Price
Carbon Pricing-Only	-12.9%	-13.6%	-14.3%	-19.3%

TCI: Cap-and-Trade Program on Transportation Emissions Only , \$19.42 in 2025 (in 2015\$)

WCI: Cap-and-Trade Program on Transportation and Heating Emissions, \$19.42 in 2025 (in 2015\$)

ESSEX: Economy-wide Carbon Tax (Electricity Exempt), \$30 in 2025 (in 2015\$)

High Price: Economy-wide Carbon Tax (Electricity Exempt), \$76.58 in 2025 (in 2015\$)

Key Finding: Combined approaches consistent with 2025 US Climate Alliance targets (26-28% below 2005)

Projected GHG emissions in 2025 relative to 2005				
	Carbon Price Policy			
	TCI	WCI	ESSEX	High Price
Carbon Pricing-Only	-12.9%	-13.6%	-14.3%	-19.3%
Carbon Pricing and VCAC Transportation Nonpricing policies only	-18.8%	-19.7%	-20.9%	-25.2%
Combined Pricing and All Nonpricing policies (VCAC and RES)	-31.6%	-32.5%	-33.7%	-38.0%

Key Finding: Policies can be designed to offset impacts on low-income and rural households

Economic Welfare Change in 2020 (2015\$ per household)				
	Carbon Price Policy			
	TCI*	WCI*	ESSEX**	High Price*
Quintile 1	\$53	\$96	\$37	\$414
Quintile 2	\$18	\$35	\$24	\$171
Quintile 3	-\$18	-\$38	\$5	-\$132
Quintile 4	-\$22	-\$15	-\$46	-\$82
Quintile 5	-\$122	-\$251	-\$51	-\$1,240
Urban (Chittenden County)	-\$13	-\$12	\$0	-\$122
Rural (Weighted average, all other counties)	-\$20	-\$42	-\$8	-\$191

* Revenues rebated to households. ** Revenues rebated to low-income households and electricity subsidies

Key Finding: Policies can be designed to offset impacts on low-income and rural households

Economic Welfare Change in 2020 (2015\$ per household)				
	Carbon Price Policy			
	TCI*	WCI*	ESSEX**	High Price*
Quintile 1	\$53	\$96	\$37	\$414
Quintile 2	\$18	\$35	\$24	\$171
Quintile 3	-\$18	-\$38	\$5	-\$132
Quintile 4	-\$22	-\$15	-\$46	-\$82
Quintile 5	-\$122	-\$251	-\$51	-\$1,240
Urban (Chittenden County)	-\$13	-\$12	\$0	-\$122
Rural (Weighted average, all other counties)	-\$20	-\$42	-\$8	-\$191

* Revenues rebated to households. ** Revenues rebated to low-income households and electricity subsidies

Key Finding: Revenue use introduces trade-offs

- According to our modeling analysis, **per household rebates** more than offset the costs of increased energy prices for the average low-income household.
- **Reducing taxes on wage income** would lower the overall cost to Vermont's economy relative to other options considered, but these cuts would not fully offset higher energy prices.
- Devoting revenue to **finance nonpricing policies** would reduce emissions further, but would also impose higher costs on Vermonters, because this would reduce funds that could be used to partially or fully offset the economic impacts on households of carbon pricing.

Other transportation-related considerations

Different decarbonization methods may have differential impacts on

- Road wear and tear and related maintenance costs
- Public transportation infrastructure maintenance costs
- Gasoline/diesel tax revenue
- Trans-border gasoline/diesel purchase decisions



Thank You