



VERMONT LEGISLATIVE Joint Fiscal Office

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Issue Brief

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Climate Change and Public Policy Solutions in Vermont

Summary

The Vermont Global Warming Solutions Act, passed by the General Assembly in 2020, and the availability of substantial federal money present lawmakers with major policy decisions to address climate change. This issue brief on the State of Vermont's efforts to tackle climate change addresses several questions:

- What climate change programs are in place, and how are they funded?
- What are the State's requirements for reducing greenhouse gas emissions? What investments are needed to adapt to climate change and enhance resilience?
- What should legislators consider prior to future funding decisions?

Vermont has committed to greenhouse gas emissions requirements for 2025, 2030, and 2050. Given the breadth of programs already in place, meeting the target for 2025 is achievable with some work, but the target for 2030 is much more challenging. The Vermont Climate Council report, coming in December 2021, is expected to outline needed steps. Legislators will face two sometimes opposing goals—efficiency and equity—when deciding how to further address climate change without stifling growth and fairness.

JFO's Series of Issue Briefs on Major Investment Areas

The recent surge in federal funding to Vermont stemming from the coronavirus pandemic has facilitated significant investments in state funding priorities. During the fall of 2021, the Joint Fiscal Office will release a series of issue briefs on the priority areas identified in Section G.100 of the state fiscal year (FY) 2022 funding bill, Act 74 of 2021—investments in climate change, well-being and the economy, housing, broadband, and clean water. The General Assembly set a spending target of \$1.2 billion for the five areas over three years, although actual spending may differ. Each issue brief provides some background and context for the appropriations and lays out considerations for legislators when thinking about future appropriations in the five areas.

Existing Vermont Programs for Greenhouse Gas Reduction

The State of Vermont already has many programs in place to reduce carbon emissions and improve adaptation and resilience. Many State agencies work together. Those include the Agencies of Natural Resources; of Administration; of Transportation; of Agriculture, Food and Markets; and of Commerce and Community Development; and the Department of Public Service (10 V.S.A. § 582). Existing programs to address carbon emissions and associated impacts are summarized with spending amounts in Appendix A.¹

¹ The Inventory of State of Vermont Programs to Address Climate Change (Appendix A) covers direct investment in programs that address carbon emissions funded through the budget and the Public Utilities Commission (PUC). It does not include indirect investment such as staff time at the PUC.

During fiscal years 2018 through 2021, about \$100 million per year was devoted to addressing climate change through the State budget. In addition, about \$60 million on average flowed through the Energy Efficiency Utility program with the bulk of that spending in Efficiency Vermont, the nation's first statewide energy efficiency utility with a focus on the electricity and thermal sectors.

The COVID-19 pandemic presented many challenges, but it also presented opportunities for investment through the major stimulus packages from the federal government. Federal money enabled more spending by the Electric Efficiency Fund for weatherization and heating projects, the Clean Energy Development Fund for community-scale renewable energy, and many transportation initiatives including the Transportation Alternatives Program (TAP) that invests in pedestrian, bicycle, and nondriver access to public transportation in communities statewide.

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In fiscal year 2022, the State of Vermont plans to invest more than \$228 million of State and federal funds in programs ranging from weatherization to public transportation and electric vehicles to environmental conservation. The State budget provides more than \$172 million of State and federal funds to reduce greenhouse gas emissions, adapt to climate change, and build resiliency through initiatives that support Vermonters and businesses. \$50 million of the \$172 million was from federal funds in the American Rescue Plan Act. In addition, the Public Utility Commission (PUC) plans to invest over \$56 million in green initiatives.²

Together, those investments cover a diverse range of programs from infrastructure to transportation to environmental conservation. One of the longest running initiatives is the Home Weatherization Assistance program. The program assists Vermonters with low income with energy efficiency improvements in their homes and reduces greenhouse gas emissions. Several programs target the transportation sector, the largest contributor to greenhouse gas emissions statewide, including:

- incentivizing sales of electric, hybrid, and fuel-efficient vehicles;
- encouraging residents to adopt cleaner and more efficient transportation modes;
- assisting low-income residents with vehicle emissions repairs; and
- expanding the infrastructure for charging electric vehicles.

Requirements Set by the Global Warming Solutions Act

The State of Vermont codified its greenhouse gas emissions requirements in Act 153, the 2020 Global Warming Solutions Act (GWSA, 10 V.S.A. § 578). The Act also established the Vermont Climate Council to develop a plan to reach the emission requirements. Looking to the future, the Vermont Climate Council will release their Climate Action Plan on December 1, 2021, to outline the steps necessary to achieve the requirements for greenhouse gas emissions reductions in 2025, 2030, and 2050.

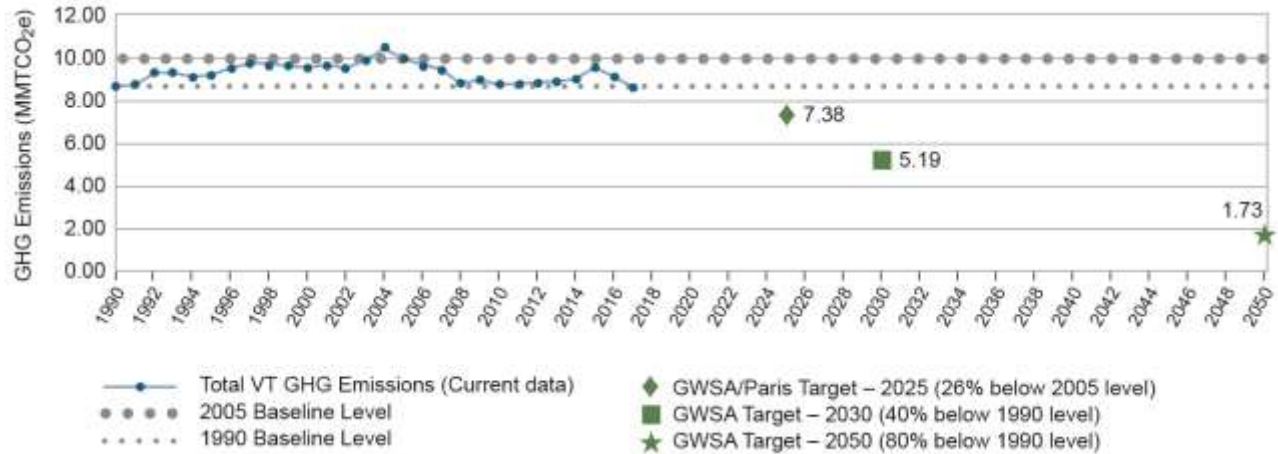
According to the Greenhouse Gas Emissions Inventory Report released in May 2021,³ gross greenhouse gas emissions in the state in 2017 were 8.67 million metric tons of CO₂ equivalent (MMT_{CO₂e}), 0.3 percent above the 1990 baseline levels and 13.1 percent below 2005 levels (see Figure 1). Requirements for 2025, 2030, and 2050 shown in Figure 1 reflect the requirements in the GWSA. The 2025 requirement, for example, mandates that Vermont's emissions be at least 26 percent below emissions in 2005, consistent with the 2016 Paris Agreement.

To appreciate the challenges involved in achieving the requirements established in the GWSA, understanding the pattern of greenhouse gas emissions in the past is important.

² The PUC is funded through a gross receipts tax paid by the major utilities that are regulated by the PUC, fees paid by applicants for certificates of public good who are not paying a gross receipts tax, and billbacks associated with hearings conducted by the Commission. No funding comes from the General Fund.

³ See Appendix C for references.

Figure 1. Greenhouse Gas Emissions in Vermont, 1990-2017 and Requirements for 2025, 2030, 2050



Source: Vermont Greenhouse Gas Emissions Inventory and Forecast: 1990 – 2017.

Vermont’s contributions to the global problem of greenhouse gas emissions come largely from the transportation and heating sectors (see Table 1). Together, those two sectors account for 70 percent of greenhouse gas emissions in Vermont. Existing technology, such as electric vehicles and heat pumps, offers significant opportunities in both sectors to reduce greenhouse gas emissions.

Those technologies are often expensive initially but have long-term savings, suggesting that State-funded programs can play an important role in an equitable transition to a sustainable environment and economy.

Table 1: Vermont Greenhouse Gas Inventory by Sector

Inventory Sector	MMTCO ₂ e (2017)	Percent of Total
Transportation/Mobile Combustion	3.39	39.1%
Residential/Commercial Fuel Use	2.69	31.0%
Agriculture	1.37	15.8%
Industrial Processes	0.57	6.5%
Electric Generation	0.49	5.7%
Waste	0.13	1.5%
Fossil Fuel Industry	0.03	0.3%
Total	8.67	100.0%

Source: Vermont Greenhouse Gas Emissions Inventory and Forecast: 1990 – 2017.

Gross vs. Net Emissions. The Greenhouse Gas Inventory Report and the 2025 and 2030 GWSA requirements focus mainly on gross annual emissions, but the 2050 requirement is stated in terms of net carbon emissions.⁴ For 2025 and 2030, carbon sequestration from forests, for example, is not subtracted from total emissions resulting from human activity. Vermont’s forests are a net carbon sink⁵ and are estimated to have sequestered 4.63 MMTCO₂e in 2017.

That amount is significant but does not affect the gross annual emissions totals or requirements because the focus of the inventory is on gross annual emissions. The GWSA requires zero net emissions by 2050, however, and data from the U.S. Forest Service shows the rate of sequestration has been gradually declining since the 1990 baseline (see Figure B1 in Appendix B). That trend is likely to continue because forests are vulnerable in a changing climate. Less carbon sequestered by forests over time implies larger needed reductions in gross carbon emissions by 2050.

4 Gross emissions represent the total amount of greenhouse gas emissions from the sectors listed in Table 2. Net emissions represent gross emissions minus sequestration from carbon sinks, such as forests and agricultural soils. For more discussion, see Appendix B.

5 A carbon sink is anything that absorbs more carbon from the atmosphere than is released. For example, a forest, the ocean and soil are carbon sinks.

Forthcoming Strategies and Associated Considerations

Vermont will need to implement a wide variety of ambitious public policy solutions to achieve the requirements established in the GWSA. The Act requires policy makers to simultaneously consider equity (being fair and avoiding disproportionate impacts on some) and efficiency (achieving the largest reduction in emissions per dollar invested).

Any climate solution or policy has the potential to impose disproportionate hardship on certain Vermonters. High-income people have been early adopters of major technological and social transformations – the debut of electricity, broadband, or public education, for example. People with lower incomes have been generally less able to benefit owing to upfront costs, price adjustments, lifestyle changes, or other unforeseen consequences. The same is happening as electrification of vehicles and heating rolls out. As a result, lawmakers might consider supplemental legislation to offset the impacts of emission reduction policies on Vermonters with low and middle incomes, those living in rural areas, or others adversely affected.

Public policy options for achieving emissions requirements include the following:

- **Carbon pricing** places a fee or tax on greenhouse gas emissions resulting from producing or consuming goods and services. Revenues can be invested to reduce emissions or distributed to ease disproportionate effects borne by citizens with low and middle incomes.
- **Cap-and-trade system** limits (or caps) emissions and creates a market for businesses to buy or sell emission allowances (permission to emit greenhouse gasses over some otherwise established level). Vermont already participates in a cap-and-trade system for electricity through the Regional Greenhouse Gas Initiative. A similar program could be set up for the heating and transportation sectors to limit emissions and incentivize switching to lower-emission fuel sources. Such methods work best when coupled with direct public investment to help address equity concerns. A report commissioned by the legislature in 2019 recommended such a solution (Regulatory Assistance Project, 2019).
- **Direct public investment** can occur in various forms including technology subsidies, grants for innovation and research, procurement standards, and clean energy products. Some examples include the following:
 - Prioritize technology subsidies with the biggest bang for the buck based on energy efficiency evaluations. For example, when weatherizing a home, insulation is better than new windows on a “per dollar” emission reduction basis. To increase equity, programs could include tiered subsidies based on income or direct support for rural households.
 - Grants for innovation and research could spur new technologies that may have long-term benefits but carry more risk.
 - Setting efficiency standards for State purchases is one way to lead by example while also reducing greenhouse gas emissions.
 - The Infrastructure Investment and Jobs Act signed into law on November 16, 2021 as well as federal legislation now under negotiation are likely to help Vermont fund some of the needed public investments in electric vehicles, charging stations, heat pumps, hot water heat pumps, and cleaner fuel.

More specific policy strategies to reduce greenhouse gas emissions, increase adaptation to climate change, and improve resiliency will be released soon. The Climate Action Plan coming from the Vermont Climate Council on December 1, 2021 will illustrate the steps that Vermont needs to take to reach the GWSA requirements in 2025, 2030, and 2050.

As Vermont tackles climate change on many fronts at a rapid pace to achieve its emission requirements, the Climate Council recognizes the critical importance of maintaining a focus on social justice. The scale of changes may be surprising to some but reinforces the need to carefully implement new or expanded programs. For example, both the weatherization assistance program and incentives for the purchase of electric, hybrid, and fuel-efficient vehicles will have to be scaled up dramatically – likely several-fold – and sustained for a period of years. Participation by households at all income levels, especially households with low and middle incomes, will be key to adopting those new technologies on a large scale. Integrating equity considerations could soften negative impacts of rapid change on marginalized communities.

Appendix A: Inventory of State of Vermont Programs to Address Climate Change

The table below represents JFO's best effort to account for State spending to address climate change and reduce carbon emissions. The table reveals long-time investment in weatherization, for example, and the large share of spending in the transportation sector.

Inventory of Greenhouse Gas Reduction Funding by the State of Vermont					
	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022 All Sources
Miscellaneous Programs and Funding					
Treasurer: efficiency investment in state buildings ¹		500,000	-		
Treasurer: \$5 million to accelerate weatherization and housing		1,000,000	-		
DCF: OEO weatherization assistance - general ^{1a}	10,919,329	10,169,329	10,669,068	12,038,018	4,000,000
AOA: Vermont House Finance Agency					9,000,000
Efficiency Vermont: air quality improvement program			16,886,527		
DPS: Efficiency Vermont: Electric Efficiency Fund - weatherization					7,000,000
DPS: Clean Energy Development Fund - community-scale renewable energy					20,000,000
DCF: Community Action Agencies					2,000,000
DCF: OEO Weatherization assistance - boiler furnace replacement		750,000	750,000		5,000,000
Clean Energy Development Fund - solar tax credit	1,750,000		-		-
Clean Energy Development Fund - wood tax credit		200,000	-		-
State electric vehicles and charging stations ²			500,000		-
Electric vehicle incentives - AG settlement funds			1,500,000		-
ANR: Volkswagen mitigation trust		1,800,000	1,800,000		-
Housing Development Investment and Policy					
VHCB - Housing capital bill appropriation ^{2a}	60,000	90,000	90,000		-
VHCB - Budget housing ^{2b}	245,121	245,121	245,121		-
VHCB - Revenue bond ^{2c}	750,000	750,000	350,000		-
VHCB - Water quality and conservation projects		2,882,998	1,700,000	1,700,000	
VHCB - NHR - conservation of natural areas		450,000	450,000	450,000	
VHCB - Conservation and Farm Viability		500,000	250,000		10,000,000
ACCD - Bylaws modernization, energy planning, density ADUs, etc.	300,000	300,000	-		2,500,000
Miscellaneous Total	\$14,024,450	\$19,637,448	\$15,904,189	\$14,188,018	\$9,500,000
Transportation Bill					
Public transit	32,132,157	29,020,229	33,824,399	38,734,820	42,821,522
Park & Ride	3,387,267	3,807,556	2,651,588	5,580,568	5,220,233
Multi-Modal facilities	2,476,909	-	-		-
Amtrak	8,150,000	8,350,000	8,300,000	800,000	8,750,000
Rail infrastructure	29,831,250	21,710,725	26,635,351	24,144,448	27,630,019
Bike-Ped	11,590,489	10,866,048	13,040,923	17,930,970	16,789,554
Town Transportation Alternatives	3,893,240	3,600,875	3,268,618	2,763,408	4,454,294
Incentive Programs for EVs			2,000,000	1,000,000	3,250,000
MileageSmart				800,000	1,250,000
Emissions Repair Program					375,000
Replace Your Ride					1,500,000
E-Bike Incentives					50,000
Microtransit Innovation Grants (MTI)				500,000	
EV Charger Grants					1,000,000
Transportation Bill Total	\$91,461,312	\$77,355,433	\$85,838,360	\$92,254,214	\$113,090,622
STATE BUDGET TOTAL (miscellaneous and transportation)	\$105,485,762	\$96,992,881	\$101,742,549	\$106,442,232	\$172,590,622
Other Programs					
Energy Efficiency Utility (by Order of Appointment by PUC)³					
Efficiency Vermont ⁴	60,502,956	60,452,488	59,941,693	46,762,300	46,814,856
City of Burlington Electric Department	3,169,115	3,328,309	3,166,477	2,253,894	2,165,430
Vermont Gas Systems	3,148,958	3,281,561	3,300,012	6,059,088	7,295,648
Energy Efficiency Utility Total	\$66,821,029	\$67,062,358	\$66,408,182	\$55,075,282	\$56,275,934
Subcategories within Energy Efficiency Utility					
Dedication for BGS (\$290,000 in FY 2016 and growing) ⁵	\$327,793	\$341,438	\$268,268	??	??
RGGI Program Impact ⁶	\$1,760,000	??	??	\$2,325,159	\$2,367,305
ISO New England Forward Capacity Market	???	??	??	\$6,286,540	\$6,519,981

Sources: Vermont's budget bills, FY 2018--FY 2022; Conversations with experts in the Administration including TJ Poor, Brian Cotterill, and Gregg Farber (Public Service Department), and Daniel Edson (Department of Buildings and General Services).

Notes

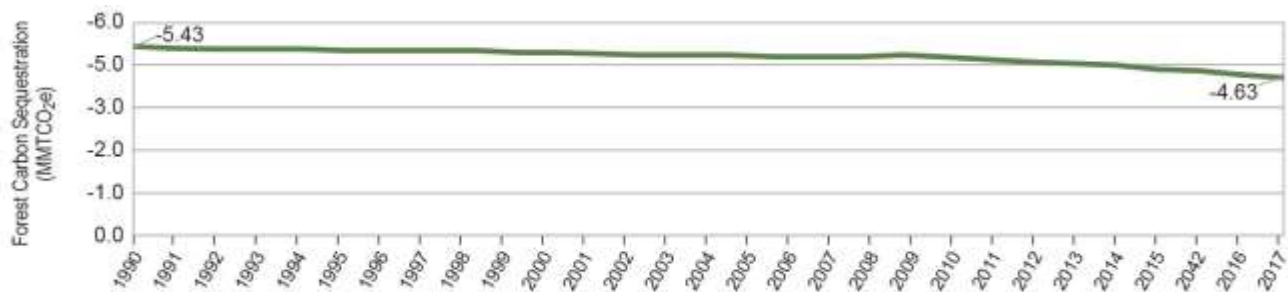
- 1 Only \$30,000 has been used to buy down interest on internal revolving loans for state building efficiency projects.
- 1a These are Governor-recommend numbers. The actual split between federal and State will be different, but the total is likely to be similar.
- 2 One-time appropriations for fiscal year 2019 to strengthen Vermont's digital infrastructure, protect the general public, establish an associate degree program, invest in electric vehicle infrastructure, and increase weatherization efforts.
- 2a Assumes that of the total funding for housing, the percentage is related to efficiency - also partner with weatherization and RGGI.
- 2b Assumes that of the total funding, 50% is for housing.
- 2c Timing is when dollars were committed. Estimate only.
- 3 Energy Efficiency Utility: created by Order of Appointment of the Vermont Public Utility Commission. The revenue source is not State dollars, so EEU is listed in "other." Amounts are for a calendar year, not a fiscal year.
- 4 Efficiency Vermont's mission is to help all Vermonters reduce energy costs, strengthen the economy, and protect Vermont's environment.
- 5 The 2020 bill has language extending the BGS agreement with Efficiency Vermont regarding dedicated funds for State buildings efficiency.
- 6 For 2018, the remaining balance of approximately \$1.76 million will be deposited into the Electrical Efficiency Fund from auctions.

Appendix B. Carbon Offsets in Vermont Forests

One way for businesses, governments, and other institutions to claim reductions in greenhouse gas emissions is through the purchase of credits, or “carbon offsets,” on voluntary or mandatory markets. Carbon offsets are a carbon accounting tool used to achieve a net carbon emissions goal, such as Vermont’s 2050 requirement. Vermont forests have significant potential to produce carbon offsets to fulfill the increasing demand for them. About 80 percent of forests in Vermont are held by private landowners who can generate carbon offsets and earn income by utilizing their forest’s emissions reductions. At the same time, protecting Vermont’s forests as providers of useful sequestration will be important going forward (see Figure B1 below).⁶

Looking ahead, it is important to avoid double counting of emissions reductions associated with forests. For example, if a Vermont landowner sells carbon offsets as credits against greenhouse gas emissions in California, those same emission reductions cannot be counted again towards the Vermont net emissions requirements. The Vermont Forest Carbon Sequestration Working Group recommends, “If the State of Vermont were to create a state carbon accounting system... the State should develop and adopt rules that prevent double counting of carbon” and “Double counting is also a concern if carbon sequestration is counted towards a statewide or community emissions reduction goal... Any future legislation or regulations accounting for carbon storage or sequestration need to recognize and avoid the risk of double counting” (Vermont Legislature, 2020). Further work is needed to analyze the effects of participating in carbon offset markets and monetizing the value of natural sequestration from Vermont lands.⁷

Figure B1. Sequestration of CO₂ from Vermont forested areas and urban trees, 1990—2017



Source: Vermont Greenhouse Gas Emissions Inventory and Forecast: 1990 – 2017.

⁶ The City of Burlington has a Climate Action Plan of its own, and it includes the goal of increasing carbon storage and sequestration with additional forest and tree coverage. See Burlington, VT Climate Action Plan, https://www.burlingtonvt.gov/sites/default/files/legacy/About_Us/Climate%20Action%20Plan.pdf.

⁷ Future work could explore carbon offset markets, how they might benefit or harm Vermont, and how the state might be involved in setting up or regulating them.

Appendix C: Additional Resources

- Vermont Climate Council Resources. <https://aoa.vermont.gov/content/vermont-climate-council>
The Vermont Climate Council, established by the GWSA in 2020, is responsible for drafting Vermont's Climate Action Plan. Its website posts resources, related documents, and the Council's meeting schedule.
- Vermont Comprehensive Energy Plan (update forthcoming).
https://publicservice.vermont.gov/publications-resources/publications/energy_plan
The Vermont Department of Public Service produces the Comprehensive Energy Plan every six years as required by 30 V.S.A. § 202b. The Comprehensive Energy Plan outlines goals, plans, and recommendations for both the public and private sector.
- Vermont Greenhouse Gas Emissions Inventory Report, May 2021.
<https://dec.vermont.gov/news/ghg-inventory>
The Greenhouse Gas Emissions Inventory Report estimates greenhouse gas emissions across different sectors of Vermont's economy. It is updated every year using the best available models and data.
- The 2021 Vermont Climate Assessment, November 2021.
<https://site.uvm.edu/vtclimateassessment/downloads-links/>
The Vermont Climate Assessment examines climate change and its effects on Vermont's economy, environment, and population. The report looks at impacts of climate change on forests, water resources, fish and wildlife, agriculture and food systems, energy, recreation and tourism, human health, community development, and carbon sequestration.
- Economic Benefits and Energy Savings through Low-Cost Carbon Management, RAP, 2019.
<https://ljfo.vermont.gov/assets/Uploads/a5e545b014/rap-carbon-management-VT-JFO-february-2019-updated.pdf>
The Regulatory Assistance Project's report offered suggested actions to address carbon emissions. The report emphasizes that energy pricing combined with practical public policies can lead to energy savings, carbon reductions, and lower costs for households and businesses.
- Vermont Forest Carbon Sequestration Working Group Report, Vermont Legislature, 2020.
<https://legislature.vermont.gov/assets/Legislative-Reports/VFCSWG-Report-Final-Report-1.4.20.pdf>
The Forest Carbon Sequestration report discusses carbon offset markets and impacts of enrolling Vermont forests in carbon offset markets through an environmental and economic lens. Overall, the report makes seven policy recommendations.
- The Climate Explorer, National Oceanic and Atmospheric Association (NOAA).
<https://crt-climate-explorer.nemac.org/>
NOAA produces The Climate Explorer as an online tool to show projections of climate and associated variables for any town or county in the United States.