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Equitable Emissions Reduction

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Rep. Emilie Kornheiser, VT State Representative

This report was written by undergraduate students at Dartmouth College under the direction of professors in the Nelson A.Rockefeller Center. Policy Research Shop (PRS) students produce non-partisan policy analyses and present their findings in a non-advocacy manner. The PRS is fully endowed by the Dartmouth Class of 1964 through a class gift given to the Center in celebration of its 50th Anniversary. This endowment ensures that the Policy Research Shop will continue to produce high-quality, non-partisan policy research for policymakers in New Hampshire and Vermont. The PRS was previously funded by major grants from the U.S. Department of Education, Fund for the Improvement of Post-Secondary Education (FIPSE) and from the Ford Foundation and by initial seed grants from the Surdna Foundation, the Lintilhac Foundation, and the Ford Motor Company Fund. Since its inception in 2005, PRS students have invested more than 70,000 hours to produce more than 200 policy briefs for policymakers in New Hampshire and Vermont.

PRS POLICY BRIEF 2122-11
JUNE 9, 2022

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EXECUTIVE SUMMARY

Vermont faces numerous challenges from climate change, which have already begun to negatively impact the state's ecosystem, economy, and public health, especially affecting rural and low-income residents. While the state's greenhouse gas emissions make up only a small fraction of total United States emissions - and are small when compared to other states - Vermont still has a long way to go to reduce emissions in the transportation, residential fuel use, and agricultural sectors. This report analyzes many of the pathways laid out in the Vermont Climate Council's Initial Vermont Climate Action Plan from December 2021, which sets goals and makes recommendations to meet the targets enacted by the Vermont legislature in the Global Warming Solutions Act of 2020. Crucially, this report focuses on the impact of these recommendations on rural and low-income communities in the state and offers strategies for effectively communicating emissions-reduction options to increase public buy-in from Vermonters. To reduce emissions in the transportation sector, this report considers methods to incentivize the use of electric vehicles and reduce overall vehicle miles traveled (VMT). In the residential fuel use sector, this report offers communications strategies to increase the home weatherization workforce. Finally, in the agricultural sector, this report provides insight on means of promoting agronomic practices to reduce tillage and increase vegetative cover, as well as a feed management program to reduce emissions from livestock. Comparisons with model programs in other states/municipalities around the country are offered throughout the report to highlight best practices that can feasibly be adopted in Vermont.

1 INTRODUCTION: VERMONT'S CHANGING CLIMATE

For decades, Vermont has been on the forefront of environmental protection. The state has a history of progressive climate legislation, stemming in part from its dependency on natural resources and environmental tourism. Forests that cover almost four-fifths of the state support both its wood products industry and the foliage tourism economy[1], which has a $300 million impact on Vermont each year.[2] Vermont has some of the country's toughest laws on environmental protection, including strict controls on carbon and other greenhouse gas emissions, air and water quality protections, and natural resource preservation ordinances. The Vermont Department of Environmental Conservation (DEC) publishes environmental rules in the Environmental Protection Rules Directory, which contains 33 chapters covering air pollution control, waste management, wastewater, groundwater, well drilling, water supplies, greenhouse gasses, wetlands, and more.[3]

However, Vermont faces pressing local challenges due to the global effects of climate change, challenges that have and will continue to disrupt the state's economy, cause environmental damage, and threaten the health of Vermonters. According to the United States Environmental Protection Agency, the state has warmed by more than two degrees Fahrenheit in the past century, almost twice as much as the rest of the contiguous 48 states. In Vermont and throughout New England, spring is arriving earlier and bringing more precipitation, heavy rainstorms are more frequent, and summer is hotter and drier. Rising temperatures throughout the state means that snow will melt earlier in the spring and increase evaporation, making both seasonal flooding and drought more severe.[4]

These changes in the state's climate will lead to numerous negative effects on Vermont's ecosystem, economy, and public health. Additionally, the changing climate may reduce the output of Vermont's $700 million dairy industry, which provides 70 percent of the state's farm revenue. Field crops and maple trees are also affected by the warmer and drier temperatures throughout the state. The ski and snowboarding industry, which generates hundreds of millions of dollars for Vermont, will also be damaged. Already, over 600 ski areas in the Northeast region have closed since the 1950s,[5] and shorter, warmer ski seasons can cause the loss of considerable revenue for the winter sports industry.[6]

Crucially, the effects of climate change in Vermont are not distributed evenly, and some particularly vulnerable Vermonters will be affected more drastically than the rest of the population. In fact, according to the Vermont Climate Council, people who live in homes without air conditioning, those who work outside, elderly Vermonters, those with disabilities, low-income communities, people of color, and people who lack housing will face much higher risks from the impacts of a changing climate than the general population.[7] This is especially true of the climate impacts to human health. Extreme weather events, from annual flooding to large-scale catastrophic events such as Hurricane Irene in 2011, will continue to cause major damage to homes, businesses, and public infrastructure. Warmer temperatures will also increase the prevalence of mosquito and tick-borne diseases such as Lyme Disease, West Nile virus, and Eastern equine encephalitis. Vermont already has one of the highest rates of Lyme Disease in the country, but analysts project that ticks and mosquitos will extend their period of activity by an extra 40 days in the early spring and late fall by the end of the century, further worsening the spread of the disease throughout the state and endangering the lives of its citizens.[8]

Total greenhouse gas emissions in Vermont are a small fraction of total United States emissions, and they are even small when compared to other states. For example, in 2018, Vermont produced only 5.9

million metric tons of Carbon Dioxide, the smallest amount of all 50 states and above only Washington D.C.[9] In terms of per-capita emissions, Vermont does quite well compared to the national average, but it has the highest per-capita greenhouse gas emissions of any state in the Northeast.[10] While Vermont's small population drives the low overall greenhouse gas emissions contribution from the state, the relatively high emissions per-capita - compared with other New England states - signifies that Vermont still has a long way to go in terms of emissions reductions.

Vermont's emissions come from relatively different sources as compared to the US overall. According to the Vermont Greenhouse Gas Emissions Inventory from 1990-2017 (released in 2021), the three largest sources of emissions for the state are the transportation, residential, commercial and industrial (RCI) fuel use, and agriculture sectors. In 2017 (the most recent year for which data are available), the transportation sector accounted for 39.1 percent of Vermont's emissions, with a total of 3.39 million metric tons of carbon dioxide equivalent ($MMTCO_2e$). The RCI fuel use sector accounted for 31.0 percent of Vermont's emissions, or 2.69 $MMTCO_2e$. Finally, the agricultural sector accounted for 15.8 percent of Vermont's greenhouse gas emissions, or 1.37 $MMTCO_2e$.[11] This is in contrast with the United States as a whole, where the largest three sources are transportation (30 percent), electricity generation (28 percent), and RCI fuel use (25 percent).[12] Agriculture accounts for only eight percent of greenhouse gas emissions in the United States as a whole. In Vermont, the transportation, fuel use, and agriculture sectors are a much larger proportion of the total greenhouse gas emissions due to the state's rural nature and cold temperatures. This creates unique challenges for the state in decarbonizing its economy.

1.1 VULNERABLE GROUP: LOW-INCOME VERMONTERS

Climate change has a disproportionately large impact on low-income communities. Studies commissioned by the United Nations have shown that low-income populations are particularly vulnerable to climate change-related dangers such as intense heat, drought, flooding, and disease.[13] Additionally, low-income communities are more significantly impacted by changes in prices for essential goods and services such as food, and these prices are often driven up as a result of climate-related weather events.[14] Finally, these events often raise insurance premiums, further increasing the financial burden on low-income communities.[15]

These patterns, though derived from a global sample, hold true in Vermont. Vermont's mean yearly temperature has risen just over two degrees in the past twenty years, which is a full half-degree higher than the national average.[16] This rise in temperature has led to an increase in severe thunder and hail storms, the leading cause of property damage in the state, and has raised the prices of home and automobile insurance.[17] Naturally, the increase in storms has led to an increase in flood danger as many Vermont towns and villages border rivers.[18] Low-income Vermonters, especially those living in mobile homes, are particularly vulnerable to these floods. When Hurricane Irene swept the state in 2011 it destroyed or damaged 800 homes and businesses,[19] 133 of which were mobile homes.[20] Considering that mobile homes constitute roughly seven percent of Vermont's homes,[21] the fact that almost seventeen percent of buildings destroyed by Irene were mobile homes highlights the vulnerability of Vermont's poorest residents.

1.2 VULNERABLE GROUP: RURAL VERMONTERS

Communication and implementation strategies tailored to rural communities could significantly maximize participation in non-regulatory climate policies. Rural citizens comprise 65 percent of the state population and are more vulnerable to the effects of climate change than urban citizens.[22] Climate change poses a number of threats to rural populations and has major socioeconomic impacts on rural communities, including heightened costs of water, energy, housing, transportation, food, and healthcare.[23] Drastic temperature and precipitation fluctuations and extreme weather harm the agriculture industry, as well as increase wear on roads, creating infrastructural barriers to access to schools and hospitals.[24] Hotter summers and colder weather will increase weather-related sickness and deaths. Despite these threats, rural communities face challenges that might overshadow the impending crisis of climate change. On average, rural communities have lower rates of education, worse access to healthcare, and lower median incomes. Energy and transportation burdens remain highest in low-income, rural households.[25] But climate change will ultimately only exacerbate these inequities.

Reducing greenhouse gas emissions and bettering Vermont's rural communities do not have to be mutually exclusive goals. Changes in the transportation, energy, and agriculture sectors can actually strengthen Vermont's economy through workforce development, supporting sustainable industries, and alleviating individual costs for fuel. The burden climate change poses to Vermonters necessitates not only the creation of effective climate policy but effective communication of the threats of climate change and the economic benefits to be had in making emission-reducing decisions.

1.3 REPORT GOALS

Our report aims to provide insight into how the state of Vermont can effectively implement and communicate non-regulatory policies in an equitable manner, particularly with respect to low-income and rural citizens. We choose to focus on those policies that require high levels of participation in order to be successful, creating a special need for strategic communication and implementation strategies. Low-income and rural Vermonters are among the most vulnerable to climate change in the state, yet obstacles in the form of inaccessibility, political division, and a lack of information can inhibit their much-needed participation in Vermont's climate conversation and fight toward the 2025 emissions reduction goal. Thus, we will examine the Vermont Climate Action Plan's policies under the three categories that yield the highest emissions (transportation, residential fuel use, and agriculture) so that our research may be a helpful supplement to the Vermont Climate Action Plan in equitable policy implementation and communication.

2 REDUCING EMISSIONS FROM TRANSPORTATION

Transportation and mobile vehicles are the largest source of greenhouse gas emissions in Vermont, comprising 39.1 percent of the state's emissions. This is because the vast majority (or 94 percent) of Vermont's transportation energy use comes from fossil fuel sources.[26] The main contributors to these emissions are on-road gasoline and diesel vehicles, with aviation and jet fuel making up a much smaller percentage. According to the Vermont DEC, on-road gasoline use from light-duty vehicles accounts for 71 percent of total transportation emissions in the state, while on-road diesel use from heavy-duty vehicles accounts for 11 percent.[27] Due to the rural nature of the state and the settlement patterns of

Vermonters, the state's average per-capita vehicle miles traveled (VMT) was 11,773 miles in 2019, which is much higher than the national average and the averages of surrounding states such as Maine, New Hampshire, and Massachusetts. Additionally, in 2020, 85 percent of all new vehicles sold in Vermont were SUVs or light trucks, as opposed to only 55 percent in 2012. These larger vehicles emit far more CO_2 than smaller passenger vehicles, and their increased share in Vermont's vehicle market only harms the state's emissions reduction efforts.[28] The combination of Vermont's mostly rural nature, dispersed land-use patterns, and heavy reliance on gas-powered vehicles is a significant reason why Vermonters emit more greenhouse gasses per capita than any other state in New England.[29]

In addition, there are inequities in access to affordable and accessible transportation among different demographic groups in Vermont. About seven percent of households in Vermont do not own a vehicle, mostly due to unaffordability. Most importantly, lower-income Vermonters spend a much higher proportion of their income on transportation, especially if they live in rural areas. According to Efficiency Vermont's Energy Burden Report, in some areas of the state, residents can spend as much as 10 percent of their annual income on transportation, while wealthier residents or those who live in cities can spend as low as 2.9 percent.[30] Transportation costs, including ownership, operation and maintenance of a vehicle, equate to roughly 45 percent of energy expenditures for the average Vermont household, which significantly burdens low-income households in the state.[31] Low-income rural residents also drive cars that are on average four years older than residents that make over $100,000 a year. This means higher maintenance and repair costs along with greater carbon emissions per mile traveled.[32] For these low-income Vermonters in rural areas, the most effective means of decarbonizing their transportation and saving money -- electric vehicles and high-quality public transportation -- remain far out of reach.

Many solutions have been proposed to reduce GHG emissions in Vermont, including dramatically increasing the affordability of electric vehicles, reducing per capita VMT, expanding accessibility of public transportation and ridesharing, and promoting teleworking.[33] Implemented correctly, these measures can help shrink Vermont's carbon footprint while reducing the transportation burden on low-income Vermonters. This section of the report will focus on the two pathways to reducing transportation emissions outlined by the Vermont Climate Council Report that have the greatest relevance to the lives and budgets of Vermonters, particularly rural and low-income Vermonters. These are Pathway 1 (Light-Duty Electrification) and Pathway 3 (Reduction in Vehicle Miles Traveled). This report will outline proposals necessary to bridge the gaps between Vermont's progressive environmental targets and policies and the realities of citizen behavior in Vermont.

2.1 LIGHT-DUTY ELECTRIFICATION

While Vermont has some of the most progressive policies on electric vehicles in the country, very few Vermonters are driving electric vehicles. According to the U.S. Department of Energy Alternative Fuels Data Center, as of November 2020, Vermont had the highest number of public chargers per capita of any state in the country, with 114 chargers per 100,000 people.[34] Vermont also has a plethora of progressive incentives for citizens (particularly low-income citizens) to be able to afford an electric vehicle.[35] Despite this, there is still significant room for progress. Vermont ranks 9th in the country on total EV adoption rate, with battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) together only accounting for 5.4 percent in 2021,[36] with a total of 6,585 plug-in electric vehicles registered in the state.

This slow uptake of electric vehicles leaves the state lagging behind both its targets for EV adoption and its vehicle efficiency and environmental impact goals. Vermont's Climate Action Plan (CAP) indicates that approximately 170,000 electric vehicles will need to be deployed by 2030 in order to meet the GWSA's emissions reduction requirements.[37] The first benchmark, according to Vermont Agency of Natural Resources Secretary Julie Moore, is to have 43,000 electric cars on the road by 2025.[38] Increasing the share of electric vehicles on the road in Vermont - and thereby reducing the state's greenhouse gas emissions - will require concerted efforts to change Vermonters' behavior by effectively communicating the benefits, performance issues, and perceptions of electric vehicles.

2.1.1 PROPOSAL: ASSURE VERMONTERS OF EV PRICE BENEFITS

A wealth of research has concluded that financial incentives - including rebates - are effective in bringing down the upfront cost of electric vehicles. Around 40 percent of people purchasing electric vehicles in Vermont have used incentives, and 45 percent of these have been low-income Vermonters making $50,000 or less per year.[39] Drive Electric Vermont's 2016 consumer awareness survey found that the likelihood of EV purchase increased from a baseline range of approximately 20-25% without incentives up to 41% with incentives of $2,500 or higher. For example, a $10,000 2017 Nissan LEAF incentive program resulted in an approximate eight-fold increase in Vermont sales compared to prior years. Subsequently, Nissan continued to offer a $5,000 LEAF discount in 2018 and 2019, but the resulting sales have been markedly lower than what was experienced at the $10,000 incentive level.[40]

Overall, low-income households tend to be more sensitive to vehicle prices. A study by Resources for the Future finds that the lowest income group (making less than $44 thousand per year) responds almost twice as strongly as the highest-income group (making more than $185 thousand per year) to a 1 percent increase in vehicle price.[41] Thus, offering larger subsidies to low-income citizens should be effective at boosting sales.

Vermont currently offers a tiered system of electric vehicle incentives through Efficiency Vermont that discerns the type of car (BEV or PHEV) and the income and marital status of the buyer.[42] Vermont's incentives range from $1,500 to $3,000 for plug-in hybrid electric vehicles and from $2,500 to $4,000 for all-electric vehicles on top of the federal incentive of up to $7,500, depending on income and marital status.[43] Raising these incentives and more accurately targeting them to low-income households would bring down the upfront purchase price of new electric vehicles and allow more low-income Vermonters to obtain them. Increasing benefits specifically for low-income households would also be a cost-effective measure compared with increasing incentives across the board. Resources for the Future finds that targeting incentives towards the lowest two income brackets would save over $6,000 in subsidy expenditures per additional plug-in vehicle sold over a uniform incentive for all income groups (see Figure 2.1.1.1.) In this scenario, prioritizing equity does not trade off with effectiveness in adding EVs to the road and cutting transportation emissions.[44]

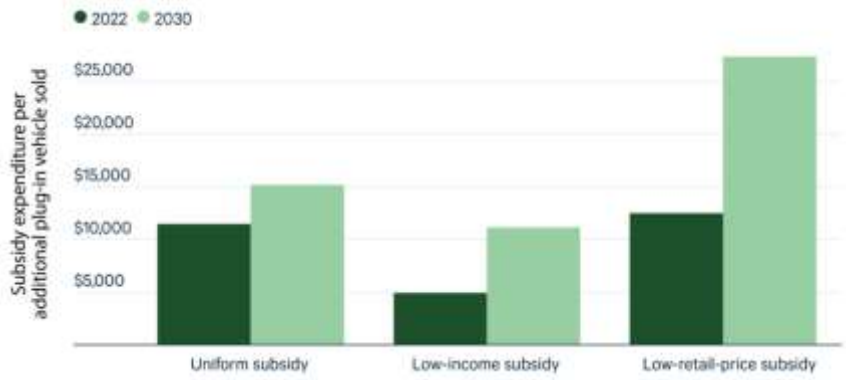

Figure 2.1.1.1 Average Subsidy Expenditure per Additional Plug-in Vehicle Sold[45]

The state could also collect data on and apply incentive funding for the purchase of used EVs. The Vermont Department of Motor Vehicles reported that "Used EV registrations continue to grow," but the state does not yet have "precise information on used EV sales."[46] A 2017 CarMax survey estimated that about 34 percent of EVs are bought used, and this number has likely grown since then. Cars that sold at $30,000 when originally bought often sell for just $6,000 at 3-4 years old and with less than 40,000 miles.[47] This makes these vehicles incredibly attractive to low-income citizens who can't afford to buy a new car, especially after factoring in incentive programs. Vermont currently supports the MileageSmart Program, which offers 25 percent off the purchase price (up to $5,000) for high-efficiency used vehicles bought by low-income (below 80 percent the average state income) Vermonters.[48] This program could be expanded, and additional incentives could be offered to low-income citizens who buy BEVs or PHEVs, as opposed to hybrid or other non-electric high-efficiency vehicles.

Another option is more effective communication of the financial and health benefits of driving an electric vehicle over the lifetime of the car. Electric vehicles emit less pollution, cost less to fuel, and require less maintenance than a conventional car.[49] Taking two similar EV and non EV cars as an example, a Chevrolet Bolt costs $8,000 more to purchase than a Hyundai Elantra GT, but the Bolt costs $15,000 less to operate over a 200,000-mile lifetime, for a savings of $7,000.[50] Such savings would greatly benefit low-income Vermonters, for whom spending on transportation-related costs such as gas make up a sizable portion of their annual budget. A report from the International Council on Clean Transportation found that, for car owners in the lowest-income quintile, savings from switching to EVs amount to $1,000 per household annually, or 7% of income, by 2030.[51] Greater use of EVs would also have public health benefits for low-income Vermonters, who tend to think in terms of personal finance or health considerations.

Many rural and low-income households remain unaware of these cost savings, however. A study conducted by the Puget Sound Clean Air Agency found that overall knowledge of electric vehicles was poor among low-income residents, with only 10% of respondents saying they had an "excellent" knowledge of EVs.[52] The study found that many low-income residents are open to the idea of buying an electric vehicle, but simply not knowledgeable about incentives and cost advantages. To address this, Vermont and local governments could partner with utilities such as Green Mountain Power and rural electric cooperatives such as Vermont Electric Cooperative to educate residents on charging infrastructure incentives and electricity rates for EV drivers offered by the utility, the existing state and federal vehicle incentives eligible to customers within

their service territory, and the savings incurred over the lifetime of the vehicle by switching to EVs.[53]

2.1.2 PROPOSAL: ASSUAGE PERFORMANCE CONCERNS

In addition to upfront cost, Vermonters have concerns over the capabilities of electric vehicles that have prevented stronger EV sales in the recent past. A 2021 Survey by J.D. Power finds that electric vehicle range is the factor most cited by consumers on the decision whether to buy an EV, or which model of EV to buy.[54] The survey also finds that satisfaction scores for electric vehicles are dependent on how far the car can travel on a single charge.

Assuaging public concerns over electric vehicle range begins with robust statewide EV charging infrastructure, an area where Vermont already excels. As of February 4th, 2022, there are 321 locations with public charging in all regions of Vermont, including 32 fast chargers available for EVs equipped with this technology to quickly recharge in about 30-60 minutes for longer trips.[55] A typical electric vehicle is able to travel 44 more miles for the same price as a gallon of gasoline in the state, given current average statewide gas prices and cost per kWh.[56] Furthermore, Vermont's EV infrastructure will continue to improve, with the state set to use $21.2 million in federal funding to implement additional "alternative fuel corridors" for fast EV charging.

Finally, Vermonters - and especially rural residents - have expressed concern over the lack of available electric vehicle model types. While manufacturers are offering more EV body styles than ever before, model availability remains a significant barrier to EV adoption in rural areas around the country due to the lack of truck and All-Wheel Drive (AWD) options. Pickup trucks in particular remain a functional and cultural staple of rural America. Data from iSeeCars.com, which analyzed over 1.5 million used car sales from July 2020 through June 2021, indicate that Vermont has the 7th highest rate of truck ownership in the country, with light-duty pickup trucks accounting for 24.2 percent of all vehicles on the road in the state, compared with a national average of 15.3 percent.[57] Their worries have been justified but may soon be alleviated, as the automotive market has begun to see the first electric pickup trucks. The Ford F-150 Lightning goes on sale in Spring 2022, while the Chevrolet Silverado EV will be released in 2023.[58]

There is much that the Vermont state and local governments can do to highlight the performance capabilities of electric vehicles and promote EV sales. The first step, which Vermont has already taken, is the introduction of online resources such as Drive Electric Vermont, which lists all the plug-in vehicles available in Vermont with details about range, cargo capacity and price, along with links to dealerships.[59] Drive Electric Vermont also offers a map of Level 1/2 and fast DC chargers around the state so drivers can plan their routes.[60] Messaging promoting electric vehicles may also want to mention that 80% of EV charging happens at home, and that the state of Vermont offers numerous incentives for installation of residential EV charging stations.[61]

Finally, the state of Vermont could partner with electric utilities, cooperatives, and car dealerships to offer free test drive opportunities for electric vehicles. Rural consumers currently do not have easy access to information regarding the benefits and incentives of EVs, and often have not had the opportunity to test-drive one. Drive Electric Vermont offers an "events calendar" to allow Vermonters to demo an electric vehicle, but these events usually only happen intermittently between June and September, and drivers can only demo vehicles for a few hours. This is not enough time for a potential buyer to get an accurate understanding of the range, charge time, and performance of the

vehicle.[62] In order to truly assuage concerns over electric vehicles, the state and local utilities could make a greater effort to allow Vermonters to test drive these vehicles for an extended period and with no restrictions on mileage.

2.1.2.1 CASE STUDY: GUNNISON COUNTY ELECTRIC ASSOCIATION EV TEST DRIVE PROGRAM

The Gunnison County Electric Association is a non-profit, member-owned rural electric cooperative serving the Gunnison Valley in central Colorado. Founded in 1938, the GCEA provides electricity to over 11,000 residents across Gunnison, Hinsdale, and Saguache counties.[63] The GCEA was the first Colorado electric coop to install an EV charger in their service territory and the first electric coop in the nation to offer an EV test drive program to their members. To educate their members and bring awareness to the local community about electric vehicles, GCEA purchased a 2018 Chevy Bolt and a 2019 Tesla Model 3 that members can test drive through their EV Test Drive Program. In the early days of the program, the GCEA allowed members to drive the Chevy Bolt for up to a week free of charge or request a "guided test drive" in the Tesla Model 3.[64] However, intense interest in the program caused them to cut back on driving time. The Bolt can now be taken out for a day at a time, and the Tesla is available only for a 30-minute guided test drive.[65]

This program, the first of its kind in the nation, allows potential electric vehicle buyers to get a better sense of what it's like to own and drive an electric vehicle, including testing range and capabilities, charging time, and feel of the car. Researchers from the University of California Davis find that "The one week time-frame is important in allowing users to decide whether electric vehicles are a good fit as a daily driver."[66] Additionally, the GCEA works in other ways to market and incentivize their members to buy EVs, including by promoting cost-savings or allowing members to sign up for a Time of Use (TOU) rate, which makes charging cheaper when members charge their vehicles during off-peak times.[67] Vermont electric utility companies and cooperatives can learn from the GCEA by implementing similar EV test drive programs that allow their members to drive demonstration vehicles for up to a week. They can also take lessons from Gunnison County's robust EV promotion and incentive campaign.[68]

2.1.3 PROPOSAL: CHANGE PERCEPTIONS OF ELECTRIC VEHICLES

One of the largest barriers to widespread EV adoption in many parts of the US is the connection between personal identities and perceptions of electric vehicles. An emerging body of literature finds that stronger perceptions of EVs' symbolic meanings are associated with stronger adoption intentions. These perceptions of symbolism and identity can in some cases be stronger than instrumental factors in a consumer's decision to purchase an electric vehicle.[69] Overall, American views on electric vehicles are mixed. A recent Pew Research Center report finds that about four-in-ten Americans (39%) say that the next time they purchase a vehicle, they are at least somewhat likely to seriously consider electric, while 46% say they are not too likely or at all likely to do so.[70] These statistics break down over a few identity-based factors, such as age and partisan affiliation. A CBS News/YouGov poll found that 46% of Democrats would consider buying an electric vehicle, whereas only 15% of Republicans would consider going electric.[71] Additionally, millennials are more open to considering the purchase of an electric vehicle, particularly in comparison with Baby Boomers and older adults.[72] Additionally, a 2021 report by the Fuels Institute and the Electric Vehicle Council finds that the "top

demographic" of EV owners are middle-aged white men earning more than $100,000 annually with a college degree or higher and at least one other vehicle in their household.

The result of these factors is an overall impression of electric vehicles among the American population as little more than a "status symbol" for eco-conscious affluent consumers.[73] Evidence suggests that this sentiment is growing as partisan divisions widen. A 2021 survey by Escalent EVForward finds that the number of participants who see EVs as a "passing fad" or "stupid idea" grew five percentage points, from 13% in past reports to 18% in 2021. Overall, conservative respondents saw a 7% negative shift in sentiment towards electric vehicles, and experts voice growing concern that there may be a segment of "unwinnable" shoppers who will not turn to EVs no matter their price and performance compared to gas-powered vehicles.[74] There is also evidence to suggest that Americans living in more rural areas tend to be more conservative, and hence less likely to support electric vehicles.[75]

In order to head off these challenges, state and federal government could work with electric vehicle manufacturers and local utilities to offer various reliable EV options to consumers and effectively market those options. In Vermont, this means offering and advertising electric vehicles that an often low-income and overwhelmingly rural population will want to buy. This begins with expanding model types, such as the Ford F-150 Lightning pickup truck and Subaru Soltera AWD SUV, which are vehicles Vermonters will likely appreciate. Other options, such as Rivian's R1T pickup truck, have already begun deliveries, while latecomers like Chevrolet's Silverado EV and Tesla's Cybertruck are currently amassing reservations.[76] Making models like these widely available will be critical for EV adoption in Vermont, and the state government could work with companies and dealerships to heavily incentivize and promote these models.

Along these lines, changing perceptions of EVs will require a large and focused advertising campaign. Fortunately, a majority of the American public seems to have yet to make up their minds about electric vehicles. A Consumer Reports survey of 3,392 American drivers in 2020 finds that only 29 percent of American drivers know "quite a bit" or "a lot" about EVs, with 68 percent saying they "don't know much."[77] This widespread lack of understanding surrounding EVs presents an opportunity for factual pro-EV messaging to have a significant effect. For instance, the Consumer Reports survey also found that the attributes Americans thought would "most encourage them to purchase a plug-in electric vehicle" were if it "costs less to charge than fueling a gasoline-powered vehicle," if it has "lower maintenance costs than gasoline-powered vehicles," and if it has "a purchase price similar to a gasoline-powered vehicle in the same class."[78] Each of these factors is true or close to true of electric vehicles if local, state, and federal incentives are included in bringing down the purchase price of EVs. So an advertising campaign focused on these factors - as well as capability and performance - should be largely effective in increasing sales.

Advertising of EVs by legacy car manufacturers has seen slow progress. For a long time, legacy automakers have neglected advertising for their EV models, money-losing so-called "compliance cars" built to satisfy federal and state emissions requirements.[79] However, advertising for EVs has recently become good business for car companies. EV advertisements now outperform traditional car spots on viewer search rates after the ad airs. Viewers who saw an ad for an Audi EV, for instance, were 90% more likely to search for the brand online than viewers who saw an ad for one of the brand's combustion engine models.[80] The Vermont state government could incentivize national car brands and local dealerships to emphasize this type of advertising over advertisements for gas-powered vehicles.

Just as important as the number of EV advertisements aired is the way in which automobile companies, dealerships, and governments choose to market their electric vehicles. Social identity theory illustrates that, in order to expand the appeal of EVs beyond young, wealthy, liberal urbanites, companies and governments alike need to start marketing the capabilities of electric vehicles instead of their status as a luxury car or their environmental bona fides. Many rural and low-income Vermonters are unlikely to respond to calls to environmentalism, technology innovation, or social responsibility, but would instead be swayed by the price, performance, and capabilities of the vehicle.[81] Responding to these sentiments, Ford has marketed its F-150 Lightning by highlighting its useful features such as the front trunk and its ability to power the owner's home during an electrical outage. Karna Crawford, director of marketing communications at Ford, says that these features are "stories that you couldn't tell when you were promoting [internal combustion engine] vehicles."[82] For rural and low-income Vermonters, highlighting low price and high capability will likely sell more EVs than any pleas for environmental responsibility could.

Finally, changing individual perceptions of electric vehicles starts at the local level. A 2017 study by the California Air Resources Board found that EV adoption increased at a faster rate in neighborhoods that saw early adoption, indicating that local exposure plays a role in the decision to purchase electric vehicles.[83] Professor Donald Cox of the University of Nebraska Lincoln notes that people become more comfortable with EVs "after seeing more on the road and watching as neighbors tried them out." Cox predicts that the cycle will repeat with electric trucks saying: "It'll make a difference when Joe down the road has been driving the F-150 Lightning for a year or two and hasn't had any problems."[84] As early adopters purchase and use electric trucks or AWD electric vehicles in their communities, evidence suggests that sales of EVs will begin to climb as neighbors and friends learn about the benefits of the vehicles through personal exposure. It is therefore advantageous for the state government and local utilities to ensure EVs are widely available and accessible within all communities across the state.

2.2 REDUCE VEHICLE MILES TRAVELED

In addition to electrifying personal transportation, Vermont must also grapple with the overall number of miles that residents travel each year. This number, known as Vehicle Miles Traveled (VMT) per capita, equals the total annual miles of vehicle travel by Vermont residents divided by the total population of the state.[85] In 2019, Vermont's VMT per capita was 11,773 miles, according to the Vermont Energy Action Network, which is still higher than the Vermont 2016 Comprehensive Energy Plan (CEP) target of 11,390 VMT per capita by 2030.[86] While the state is making progress toward this goal, Vermont's per-capita annual VMT are still higher than both the national average and that of surrounding states and other rural states (see Figure 2.2.1).[87] Vermont's sparse development patterns result in longer distances between residences, work, school, and shopping locations, requiring longer trips to meet residents' needs.[88] Expanding state and local investment in transit, micro-transit, rail, bike and pedestrian infrastructure, and other transportation services beyond the single occupancy vehicle will help to cut Vermont's carbon emissions, as well as providing co-benefits to public health and equity.[89] The 2016 CEP targets a 20 percent reduction in single occupant vehicle commute trips by 2030, an objective that investment in public transportation, shared mobility, active mobility, and teleworking should help to accomplish.[90]

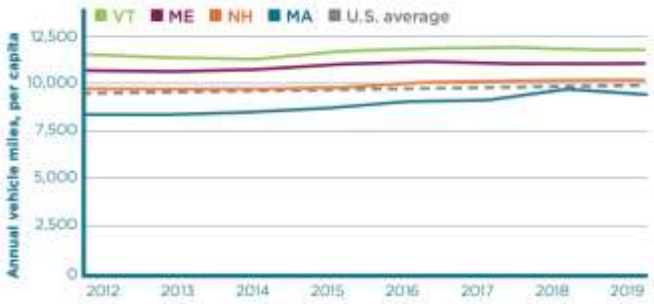

Figure 2.2.1: Vehicle Miles Traveled per Capita (2012-2019), New England and U.S. Average[91]

The lack of reliable public and shared transportation places a significant burden on populations that either cannot afford a vehicle or are unable to operate a vehicle, populations that tend to be low-income, elderly, and people with disabilities. This can lead to more time spent commuting to and from work or appointments and can impact consistent access to health care services, which can delay treatment and can lead to more serious health-related issues.[92] The lack of transportation also impacts young people looking to live and work in rural areas throughout the state.[93] The issue in reducing Vermont's VMT per capita is arguably not a lack of opportunities but a lack of participation. In order to reduce Vermont's carbon footprint and help Vermonters drive less, the state could improve incentives for public transportation, promote shared mobility options, and advertise alternatives to driving in rural areas of the state.

2.2.1 PROPOSAL: INCENTIVIZE USE OF PUBLIC TRANSPORTATION

Public transportation, including the use of public buses and rail, can provide energy-efficient transportation options to rural Vermonters. At average occupancy rates, these modes are considerably more efficient than the state's most common commute mode, the single-occupancy vehicle (SOV).[94] Vermont is currently served by seven public transit providers that offer a range of transit services, from local fixed route to commuter to demand response. A map of Vermont's public transportation routes and demand response service areas is shown in Figure 2.2.1.1[95]

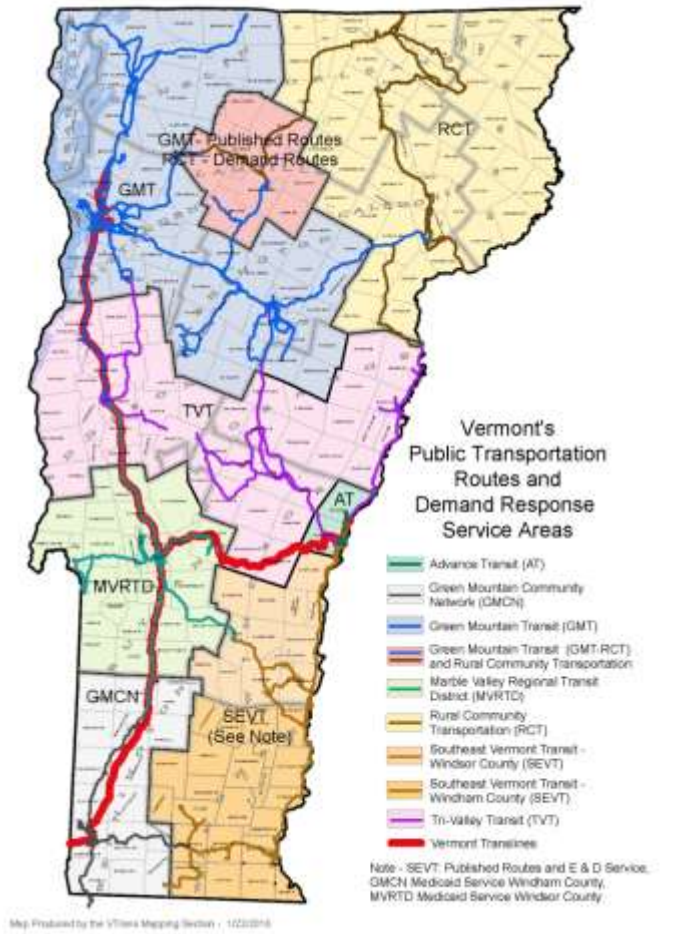

Figure 2.2.1.1: Vermont's Public Transportation Routes and Demand Response Service Areas[96]

Overall, public and private services have contributed to a transportation network that covers the entire state, leading to most Vermonters having access to some sort of public transportation. Vermont invests roughly $40 million annually in public transit, including federal, state, and local funds. On a per capita basis, that investment is much higher than similarly rural states in the US.[97] However, a combination of variable/unreliable service and lack of effective messaging have contributed to low and shrinking ridership. In the years from 2014 to 2018, total transit operating costs increased by 27%, while ridership numbers have fluctuated. Of the 4.74 million trips that Vermont's public transportation systems provided in SFY 2018, almost half were provided in the urban Chittenden County region.[98] In much of Vermont, public transit exists foremost as a social service for people without cars, and transit companies often do not pick up enough people across the state's small towns to justify the expense.[99] The "town-hopping" model of public transportation in Vermont serves as a lifeline for carless Vermonters in rural areas of the state, but it makes public transportation less convenient for people who have the option to drive. The 2016 Vermont CEP hopes to address these issues and incentivize public transportation, with an ultimate objective of increasing public transit ridership 110 percent to 8.7 million trips annually and quadrupling Vermont-based passenger rail trips to 400,000 trips annually by 2030.[100] In order for Vermont to meet its ambitious climate goals, its public transit systems would have to attract people who can otherwise drive themselves and get them to accept a certain level of inconvenience.

There are solutions that would reduce Vermont's carbon emissions without sacrificing too much convenience for Vermonters who own a car. The most straightforward of these solutions is to promote local access connections - or "first mile/last mile" connections - into an integrated transportation network. For many Vermonters, the most difficult aspect of using public transit is the first/last mile access point from the bus/rail stop or station to their own home or their destination. Consider, for example, a 2019 report for VTrans that studied the feasibility of a commuter rail line running between Montpelier and Barre, a new public transportation route that would help connect these two population centers in central Vermont.[101] Although this rail line would provide a valuable public transit option for commuters within the urban centers of Montpelier and Barre, populations living further out in East Montpelier, Middlesex, Calais, and elsewhere would likely have to drive and park at the station to access the train, which reduces the utility of a short-distance commuter rail in

the first place.[102] Increasing network integration for first/last mile connections would go a long way toward boosting transit ridership.

In addition to increased integration, improving transit frequency and flexibility may help to encourage Vermonters to ride. The Vermont Public Transit Policy Plan (PTPP) includes an extensive analysis of unmet transit needs in Vermont, having received input from local/regional meetings/forums, stakeholder interviews, and over 1,200 responses to an online survey. Various channels indicated that there are many Vermonters, especially young ones, who would like to use public transit but do not because the schedules do not work for them, or because there are missing links in the system. Increased evening or weekend service would be attractive to these Vermonters, in combination with improved first/last mile connections.[103] In places with sufficient population density, such as a residential density of at least 6 households per acre, the Vermont Legislature recommends operating a higher level of service with at least 2 or 3 buses per hour on key routes, and service hours extending into the late evening and weekends.[104]

Increased flexibility - including demand-response service - would also benefit many Vermonters. A report from the Vermont Legislature finds that certain segments of the population are much more likely to need public transit service than others, including older adults (especially those over 80), people with disabilities, low-income individuals, and young people (primarily between 13-18 years old). Many people in these population segments cannot drive because of physical limitations or because they cannot afford to own and operate a car. When people in these groups live in areas served by bus routes, they most likely use them regularly.[105] Unfortunately, there are many Vermonters in these groups who live in areas far removed from traditional bus services. These residents would benefit from increased access to demand-response service, or transportation provided to those who individually request it, either online or by calling the transit operator. According to the Union of Concerned Scientists, developing flexible or demand-response bus routes that can divert from the fixed route to pick-up or drop-off riders creates a "hub-and-spoke" model for transit that, in low density areas, can improve ridership experience.[106] To reduce per-capita VMT, Vermont could implement more frequent, flexible, and faster service among public transportation networks in the state. Green Mountain Transit's "MyRide" pilot program is an example of this concept in action, with point-to-point bus service available to Montpelier residents. The service has been a success, seeing increasing ridership and planning to expand to Chittenden County soon.[107] The one issue with demand response, however, is the increased emissions of the mostly large vans or small buses used to transport Vermont residents. VTrans finds that, depending on the occupancy and energy intensity of a given transit service, demand response may not be a lower GHG emitting option when compared with personal vehicle travel.[108] Solutions to this issue lie in increasing ridership on these vehicles, shifting transit to cleaner fuels or even EV buses, and "right-sizing" vehicles to fit the demand on a particular route (see Figure 2.2.1.2).

Figure 2.2.1.2: Energy Intensities of Common Transport Modes in 2018[109]

Finally, an outreach and awareness campaign about the benefits of public transit could have the effect of boosting ridership. This effort could be more effective when combined with capital investments in technology/service improvements or partnerships with other organizations such as ski resorts, community institutions, hospitals, schools, and universities. As mentioned in the 2019 report from the Vermont Legislature, this campaign should focus on three key themes:[110]

- Taking public transit instead of driving is an important factor in the fight against climate change.
- Public transportation improves both individual and public health by leading to more walking and reduced vehicle exhaust emissions.
- Taking the bus is a step towards reducing dependence on automobiles, oil companies, and international oil providers.

A campaign highlighting the benefits of public transportation can take many forms. The Go! Vermont website is a valuable resource for Vermonters making the decision whether to take public transportation, and promoting this website can help incentivize more Vermonters to do so. VTrans suggests the state increase marketing for this resource and make sure that other organizations that generate trips, including hospitals, institutions, large employers and large retail outlets, include links to Go! Vermont on their websites.[111] VTrans also suggests adding an interactive map of bus routes to the Go! Vermont website, adding staff and structures to improve the website, and creating a dedicated Go! Vermont mobile phone app with trip planning and bus tracking features.[112] In addition, the state could work with transit providers and private organizations to document stories of the value of public transit. This can be done by creating and sharing short videos of volunteers telling their public transit stories within each region of Vermont, through informational brochures, by partnering with organizations such as United Way and AARP of Vermont, and through an "Ambussadors" program to help Vermonters learn how the public transit system works and guide them through the process for the first time.[113] Finally, engaging with public media such as Vermont Public Radio and local newspapers/magazines such as the Burlington Free Press, Seven Days VT, and VTDigger would help to spur discussion in the public square and raise awareness of Vermont's public transportation systems.[114]

2.2.1.1 CASE STUDY: TRAVEL WASHINGTON INTERCITY BUS PROGRAM

One state leading the way in public transit integration is Washington State. For many years, Washington State's intercity bus service was declining, leaving rural communities without scheduled public transportation to other towns and cities. In response, the Washington State Department of Transportation founded Travel Washington, an intercity bus network that contracts with private companies to provide services to many rural communities. Since the service was launched in 2007, it

has since expanded to cover the entire state using mostly federal grants and relying minimally on state funds. The service has four lines, each named after Washington State products and resources: the Grape Line, the Gold Line, the Apple Line, and the Dungeness Line.[115] The Intercity Bus Program also connects to other modes of transportation throughout the state, including private bus lines like Greyhound, Bolt Bus, and Northwestern Trailways, as well as the Amtrak rail network and airports in Seattle and Pasco. The program has been heralded as a major success, with Program manager Steve Abernathy remarking on the "strong community support" the service has received. "When the Gold Line (northeastern Washington) was announced, communities were falling over each other to see who could bring the most to the ribbon cutting."[116]

In terms of statewide coverage, the intercity bus program provides a high degree of coverage to Washington's population. Approximately 76 percent of Washington residents live within 10 miles of an intercity bus stop or station, and 95 percent live within 25 miles.[117] This suggests that there are no large areas that are completely lacking in access to intercity bus service, no small feat in a state that is more than 7 times larger than Vermont in terms of land area. Abernathy highlights the economic benefits of the bus service to small communities with a station, with homes, hotels, banks, and even farmers markets popping up around transit centers. This high public use and satisfaction rate are partly due to the program's integration and accessibility across the entire state. Instead of a fragmented landscape of regional bus providers, the state maintains private partnerships that connect the entire state (as well as parts of Oregon) into a single, accessible, and easy-to-use network. The intercity bus program also works with other transportation providers like Amtrak and Greyhound to time departures to allow connections between services. Vermont can learn from this widespread, accessible, and well-integrated program by making improvements to the integration, accessibility, and timetables of its own bus routes.

2.2.2 PROPOSAL: PROMOTING SHARED MOBILITY OPTIONS

In addition to public transit via large vehicles, increasing public knowledge and understanding of shared mobility options may offer an alternative to single-occupant travel throughout the state. Shared mobility - including carpooling, car sharing, and ride hailing services - can provide an alternative to personal vehicle ownership by allowing members to access and utilize vehicles on an as-needed (and usually short-term) basis. Several recent studies suggest that shared mobility networks reduce overall car ownership rates and produce a net decrease in VMT and GHG emissions.[118] While buses and other forms of mass transit are overall better for the environment, these modes of transportation can still be superior to driving a single-occupant vehicle.

The first of these methods is carpooling or ride sharing. In 2008, Go! Vermont launched an automated carpool matching service that provides an immediate email response to online registrations and listing services that accommodate those who are looking to find a match for their daily commutes or for a single trip.[119] The rideshare/ride match program now has 5,245 registrants in the matching database, and registrants can receive emails and rewards for participating.[120] However, despite this easily accessible resource, only a small percentage of Vermonters carpool regularly, with 6 percent of Vermont commuters responding in 2016 that carpooling is their primary method of commute compared with 83 percent who describe SOVs as their primary method.[121] Additionally, the number of Vermonters carpooling to work is shrinking, with a 1.9 percent decrease between 2009 and 2017.[122]

There are a few methods to increase carpooling rates in Vermont. The first would be to further promote the Go! Vermont resource. The carpool/rideshare matching service is a valuable resource both for Vermonters who lack a personal vehicle and those who opt not to drive alone. Increased marketing and awareness of this resource and converting it to a mobile phone app would help Vermont residents find available carpool options in their community and avoid driving SOVs. Use of the program can also be incentivized through rewards such as discounts from local, regional and national retailers.[123] Second, Vermont can invest in municipal and state Park-and-Ride facilities. Park-and-ride facilities provide safe, no-cost parking spaces for those who carpool or ride the bus, facilitating greater use of shared mobility options. The 2021 Vermont Transportation Energy Profile recommends increasing the number of state park-and-ride parking spaces to 3,426 by 2030, an average of 188 parking spaces per year.[124] Third, the state can spur the growth of Go! Vermont's volunteer driver program, which has been proven the most cost-effective way to serve transportation demand in rural areas with thinly spread population centers such as the Northeast Kingdom region. This program helps to provide transportation to community members in need of a ride, mostly for medical needs. Drivers are currently offered reimbursement at the standard IRS mileage rate for each trip.[125] All across Vermont, however, agencies cite a lack of volunteers as the limiting factor on their ability to make use of this mode of transit. To increase the supply of volunteers, the state can streamline the background check process for volunteer drivers, create a check box on Vermont vehicle registration forms to sign up as a volunteer driver, establish non-monetary incentives for drivers, increase marketing budget and collaborate with partner organizations, and share best practices between agencies and regions.[126]

Another form of shared mobility is car sharing, which allows users to access rentable cars for a short time via their smartphone. These networks provide alternatives to personal vehicle ownership by allowing members to access and use vehicles on an as-needed (and usually short term) basis. Although data are mixed, several studies suggest that car sharing programs reduce overall car ownership rates, which reduces VMT.[127] There is currently one car sharing service operating in Vermont, a Burlington nonprofit called CarShare Vermont. CarShare Vermont currently operates 17 vehicles in Burlington and Winooski. The organization had attempted to expand into Montpelier but had to shut down operations there after it did not prove economically viable.[128] CarShare Vermont's expansion troubles illustrate the need for state financial assistance to help car sharing services spread into more rural areas of Vermont. More vehicles and faster reservation times would also help improve accessibility of these programs so Vermonters can quickly reserve a car near to their location.[129]

Finally, ride hailing services can serve as a vital form of transportation for people around the country, but these services have seen difficulty in expanding beyond their traditional urban hubs. Ride-hailing services such as Uber and Lyft have grown rapidly in recent years and are now available in Vermont. The Vermont Ride Network (formerly Green Cab VT) operates throughout Vermont, although the service area has been reduced during the COVID-19 pandemic.[130] The most robust ride-hailing presence is in Chittenden County, but there are a few drivers located in places such as Montpelier, the Upper Valley, and Brattleboro, and service is available during the ski season in major tourist areas such as Killington, Sugarbush and Stowe. Reasons for ridesharing services not being more broadly deployed in rural areas of the state include a perceived lack of consistent demand due to low population density, poor cell connectivity and service, and a lack of familiarity with the service.[131] There is also a question of what effect ride hailing services have on VMT. As with car-sharing, ride hailing can reduce the need for car ownership but may also replace transit and walk/bike trips with vehicle trips. Therefore, ride hailing services are most effective at reducing VMT when they do not replace active mobility trips and instead provide first/last mile connectivity to public transportation or fill gaps in the public transit

network. For example, A 2016 study from the American Public Transportation Association found that ride hailing is most popular between the hours of 10PM and 4AM, when public transit is infrequent or even unavailable. Moreover, the study found that ride hailing appeared to substitute for private auto trips rather than trips via public transit, based on a sample of 4,500 shared mobility users.[132] When they are used correctly, the VMT reduction impact of ride hailing services is clear. To help get Vermonters out of their own cars and into someone else's, the state can work to address the largest issues residents have with ride hailing services and ensure they are being used in the right ways. Increasing the availability and consistency of local ride hailing drivers could help convince Vermonters in low population areas that these services are fast and convenient, which should in turn boost demand. Ride-hailing services can also partner with outside organizations and Go! Vermont to make their services more widely accessible.

2.2.2.1 CASE STUDY: GO MAINE COMMUTER PROGRAM

A point of comparison to Vermont is the state of Maine. Both states are overwhelmingly rural, with 78 percent of Maine's population living in rural areas compared with 74 percent in Vermont. Rural average household income in both states is slightly less than $60,000 a year, while urban household income is around $70,000 per year. In both states about 30 percent of the rural population is over 60 years old, and between 10 and 15 percent of rural households live below the poverty line in both places. In terms of transportation, the average annual VMT of rural households in both states is roughly equal.[133]

GO MAINE is a statewide commuter program that works similarly to Go! Vermont by allowing Maine residents to find alternative and low-emission forms of transportation, including carpools, vanpools, bus, train, ferry, active mobility, and working from home. GOMAINE offers an interactive map helping residents plan a route the same way that Go! Vermont does, as well as links to numerous services where Maine residents can find carpools or buy tickets to modes of public transportation.[134]

GOMAINE offers two features that Vermont can learn from. The first is robust mobile integration. The program runs primarily on an app available to IOS and Android users. Members can download the app to sign up, and all services (including the interactive map and carpool or vanpool matching) are available via the user's mobile device. Go! Vermont does have an app, but it offers fewer features, has fewer users, and lower reviews. Go! Vermont also does not display the app on their website, whereas links to download the app are prominently featured on GOMAINE's website. Integrating a robust mobile service is essential for the success of these commuter programs in an era where most online traffic is generated via mobile device.

Finally, GOMAINE offers and publicizes numerous rewards for green travel, including points towards restaurant coupons, retailer discounts, and tickets to shows & attractions. Vermont offers the same types of rewards, but it arguably does not do enough to prominently feature these rewards and incentives on its website or marketing materials. GOMAINE also offers a twice-annual event called Way 2 Go Maine, which bills itself as "a friendly competition between individuals and workplaces across the state to see how many folks can walk, bike, carpool or vanpool, take the bus or train, or work from home." Individuals and workplaces can compete for rewards such as gift cards, state and national park passes, and other prizes for using alternative forms of transportation other than an SOV.[135] This competition- and GOMAINE as a whole- has seen success in reducing the state's overall

VMT, with over 18 million miles not driven, 824,000 gallons of gas saved, and 8,000 tons of emissions prevented since the app's launch in 2015.[136]

2.2.3 PROPOSAL: ADVERTISING ALTERNATIVES TO DRIVING

Although most trips in Vermont require the use of a vehicle of some kind, there are many opportunities for reducing this percentage, either by encouraging Vermonters to use active modes of transportation or by allowing them to skip the trip altogether. This is undoubtedly the most cost-effective and energy-efficient solution to reducing Vermont's per-capita VMT, although the rural nature of the state makes implementation difficult. In this regard, Vermont is already ahead of the national average, and the average among other rural states such as Maine, West Virginia, North Dakota, and South Dakota. According to VTrans, Vermonters in 2019 commuted by walking or biking at a considerably higher rate, 6.4%, than the national average or than in other rural states. Vermonters also worked from home at a higher rate than the national average or the average among the rural comparison states in VTrans's 2021 report.[137] However, these numbers remain low in absolute terms, and increasing the number of Vermonters who choose alternatives to motorized transportation would have a positive effect on reducing per-capita VMT, thereby reducing total transportation emissions (see Figure 2.2.3.1).

Figure 2.2.3.1: Commute Mode Share for Non-SOV Trips, 2019[138]

Active transportation - primarily walking and biking - has a very low energy intensity, and replacing vehicle trips with these modes can help reduce VMT, transportation energy use, and GHG emissions. According to a data set from the Vermont National Household Travel Survey (NHTS) in 2009 - the most recent date for which data is available - roughly 87 percent of trips shorter than two miles were made with a motor vehicle, suggesting an opportunity for increasing active transportation trips. The 2016 Vermont Comprehensive Energy Plan (CEP) includes an objective of increasing the share of commute trips completed by walking or biking to 15.6 percent of all commute trips by 2030.[139] In the 2016 Vermont Long-Range Transportation Planning Survey (LRTPS) only 4 percent of Vermonters identified walking as their "primary commute mode" and only 2 percent said biking.[140] These miniscule numbers illustrate the pressing need for policy solutions to help more Vermonters take advantage of active mobility options.

In order to help more Vermonters out of their cars and onto bikes or sidewalks, state and local governments have several options at their disposal. The first of these is designing street plans that take active mobility into account. Local and regional planning organizations could work with community members to identify areas for multimodal transportation planning that could include complete street planning or the development of rail trails to encourage mode shifting from personal vehicle use to other types of transportation options.[141] This may include adding or widening sidewalks, crosswalks, on-street parking, pedestrian-scaled lighting, and shared lanes for bicycles. A recent reconstruction project in downtown Waterbury that ended in 2021 implemented these designs to the benefit of bikers and pedestrians as part of the Complete Streets program.[142] The Complete Streets report highlights a wide variety of improvements that have yet to be implemented in many Vermont communities. Implementation of new features, as well as proper maintenance of existing infrastructure, are critical to making streets more bike- and pedestrian-friendly, which will help entice more Vermonters to use active transport. The Vermont 2016 LRTPS found that, among 10 percent of Vermonters, improvements to bicycle and pedestrian infrastructure would encourage them to drive less.[143] This may not be an overwhelming number, but even if a small percentage of Vermonters chose to walk or bike instead of drive, the impact on Vermont's per-capita annual VMT could be significant.

A final option to reduce Vermont's per-capita VMT is to help Vermonters work and access all necessary services either at or close to their homes. This can take many forms including teleworking, which has the potential to reduce individual VMT and greenhouse gas emissions so long as telecommuters do not increase travel for other purposes. Aside from carpooling, teleworking was the most popular non-SOV form of commute before the pandemic, with around 7 percent of employed Vermonters saying they worked from home in 2019. And according to initial data from the Vermont Transportation Energy Profile, teleworking increased substantially during the COVID-19 pandemic. From August 2020 through March 2021, the share of adult Vermonters living in a household with at least one telecommuter was approximately 40%.[144] Although the option to telework is often decided by a worker's employer or by their individual financial circumstances, state and local governments can help increase the accessibility of teleworking in one major way: investing in broadband access. According to the Vermont Department of Public Service, nearly 1 in 5 Vermonters still lack access to high speed broadband (defined as broadband with download speeds of up to 25 megabits per second and upload speeds of up to 3 megabits per second), and that lack of access is concentrated in rural areas and among low-income households.[145] A report by the Congressional Research Service finds that further broadband expansion falls on internet service providers who find investing in rural communities unprofitable because of the increased infrastructure required and fewer customers serviced leading to high per customer connection costs.[146]

Investing in high-speed broadband infrastructure for all Vermonters is a critical factor in both reducing VMT and increasing geographic and socioeconomic equity in the state. In order to increase broadband access across Vermont, state and local governments can increase funding for the buildout of broadband services within rural communities, develop public-private partnerships with internet utility providers, and provide subsidized broadband options for low-to-moderate income residents.[147] Vermont already has an organization working to tackle this issue: The Vermont Rural Broadband Project has provided consultation services to over 50 Vermont communities, helping many of them access and aggregate their demand and negotiate with potential providers to draw broadband services.[148] Support for - and expansion of - projects such as these would help solve the discrepancy between rural and urban broadband access and reduce the state's VMT per-capita in the process.

The second option for reducing vehicle trips is the revitalization of Vermont's historic downtowns and changes toward denser settlement patterns. Main streets and town centers provide vital services to rural communities by creating jobs, providing opportunities for tourism, and by creating community gathering locations.[149] The 23 municipalities that each host one of Vermont's "designated downtowns" account for more than 30 percent of the state's population. However, land-use and zoning decisions made in the era of the automobile have caused Vermonters to live farther apart over the past decades, and have made alternatives to driving inconvenient, unsafe, or impossible. Compact settlement is both helpful to Vermonters seeking to avoid driving to work or run errands and critical to the success of the state's VMT and emissions reduction goals. Promoting density begins with revitalizing Vermont's historic main streets and making downtown areas once again attractive places to live, work, shop, and play. The Vermont Downtown Program (a part of Main Street America), works to support community revitalization and historic restoration of Vermont downtown areas through tax credits, loans and grants, development of a pedestrian-friendly downtown, neighborhood development area eligibility, and *Act 250* exemptions.[150] The program currently oversees 23 designated downtowns across the state and has seen great success so far, with 244 new businesses opened, 96 new housing units completed, and 523 jobs created in 2020 alone.[151] Revitalizing downtown areas will have the dual benefit of promoting denser development and simplifying public transit requirements, creating areas around the state where the majority of trips can be taken without driving a car. Furthermore, many Vermonters say that increased density would reduce their dependence on a vehicle, with 11 percent of Vermonters identifying "living closer to work or services" as the factor most likely to encourage them to drive less.[152] Rethinking state land-use patterns and zoning laws would be an effective long-term solution to increase density and reduce per-capita VMT, but in the short-to-medium term, significant progress could be made by simply making downtown centers a more attractive place to live, work, and do business.

2.2.3.1 CASE STUDY: THE GREAT ALLEGHENY PASSAGE TRAIL

Rail trails and greenways not only provide opportunities for residents to bike, walk and explore their communities but they can also create public and private development around them that can enhance the mobility and livability of a rural community, making it a more enticing place to live, work, and visit. Rail trails are typically created after a railway has been abandoned and the track has been removed, since the gentle grades and pre-built structures such as bridges, tunnels, and historical sites make trail construction easy and increase their popularity. Beyond incentivizing active transportation such as walking or biking, rail trails have also been shown to increase property values, improve health, and increase tourism within rural communities.[153] The Great Allegheny Passage Trail (GAPT) - a 132-mile rail trail that runs from Pittsburgh, Pennsylvania to Cumberland, Maryland - highlights both the environmental and economic benefits of building these trails. Together with the C&O Canal Towpath, the trail is part of a 335-mile route between Pittsburgh and Washington, D.C. Since its completion in 2006, The GAPT has attracted an additional 700,000 yearly users to the region, generating millions of dollars of economic impact into eight small towns.[154] In 2021, the GAPT saw between 1.34 and 1.52 million users,[155] and in 2019 (the most recent year for which economic data is available) the trail drove over $121 million in economic impact, according to an analysis by Pittsburgh-based consulting firm Fourth Economy. Spending by tourists yielded an estimated $19 million in tax revenue, with $8.7 million in tax revenue going back to state, county, and local governments, and it supported nearly 1,400 jobs.[156] In addition to tourism or leisure travel, the trail is an important conduit for locals commuting to work or running errands, as it facilitates a fast and safe path for walking or biking.

Vermont has 18 rail trails and public paths spanning 130 miles across the state, but they are all either incomplete or too short to be effective for long-distance travel. These include the Baldwin Trail at Mount Independence, the Colchester Causeway, the Stowe Recreation Path, and Burlington's Waterfront Park.[157] The longest rail trail in the state is the Lamoille Valley Rail Trail (LVRT, a partnership between VTrans and the Vermont Agency of Snow Travelers), which is planned to stretch 93 miles across Northern Vermont from Swanton to Saint Johnsbury.[158] Only 34 of the 93 total miles have been completed to date, although the Vermont state legislature has authorized funding to complete the trail by 2023.[159] The economic effects of the LVRT are as of yet unknown given the trail's incomplete status, but Vermont can take lessons from the Great Allegheny Passage Trail in constructing a longer and more integrated network of trails to connect small communities with larger population centers in the future. This will have the dual effect of bringing increased economic activity to the region and enticing Vermonters and tourists to choose active transportation options instead of driving.

3 REDUCING EMISSIONS FROM RESIDENTIAL FUEL USE

Building fuel use accounts for 31 percent of statewide greenhouse gas emissions, of which residential fuel use comprises 55 percent.[160] About three-fifths of Vermont homes use fuel oil, kerosene, or propane to heat their homes- the largest proportion of any state.[161] Currently, Vermont has numerous rebate and incentive programs in place to encourage people to weatherize their homes through insulation improvements and air sealing, and to switch to cleaner energy sources through the purchase of energy-efficient appliances[162] Unfortunately, existing strategies are only effective for those Vermonters who can afford the upfront cost of these switches, even with rebates. The Vermont Climate Action plan outlines multiple strategies to reduce residential fuel use in an equitable and realistic manner, one of which is weatherization.

The following case study corresponds with the Vermont Climate Action Plan, "Buildings and Thermal Pathways for Mitigation", Pathway 1, Strategy 1, Action 2, which seeks to develop the statewide weatherization workforce.[163] In line with Vermont's climate equity goals, such development can "improve equity as long as priority is placed on measures that address unemployed/ underemployed/ displaced workers"[164] The growth of the state weatherization program can reduce the impacts of climate change on rural and low-income communities by lessening household energy burdens and by supporting local economies through the provision of green jobs.

For weatherization to effectively reduce carbon emission reduction in an equitable way, the weatherization workforce, including weatherization installers, crew chiefs, and building auditors, must be expanded. Missouri has implemented an effective strategy to achieve these goals, and their apprenticeship program could provide a source of inspiration for Vermont.

3.1 WEATHERIZATION WORKFORCE DEVELOPMENT CASE STUDY: MISSOURI

To develop the weatherization workforce in Missouri, the Northeast Community Action Corporation (NECAC) implemented a paid apprenticeship program which has gained national attention and was spotlighted by the National Association of State Community Service Programs and the National Community Action Partnership. The goal of the program is not only to expand the weatherization workforce but to endow workers with skills that prepare them for career advancement.[165] The NECAC partnered with high school vocational programs and community colleges to promote the apprenticeship and acquire participants. The program takes one year to complete and includes 144 classroom hours and 2000 hours of on-site training. Trainees graduate as a U.S. Department of Labor certified "Performance Laborer Residential and Commercial".[166] The apprenticeship program is especially appealing for recent high school graduates, allowing them flexible working locations and the ability to obtain college credit for their time. High school participants can acquire their OSHA 10 and appropriate skills in anticipation of application to the apprenticeship upon graduation. The advantages of the weatherization apprenticeship make it competitive with jobs that can pay higher wages.

The implementation of such a program in Vermont could not only provide the labor force needed to effectively weatherize homes and increase residential energy efficiency but also incentivize Vermonters to work in-state and support the state economy. Such an apprenticeship could partner with Career Technical Education schools and provide Vermont students with employable skill sets upon graduation from high school. In its first year, the NECAC hired four trainees, and was able to recruit 30 seniors from the class of 2021 for the apprenticeship. Additionally, the apprenticeship allows for locally obtained certification and increases accessibility to skill-development and career opportunities. Currently, some certifications necessary for weatherization are not offered in-state in Vermont, creating a barrier to low-income residents who may otherwise have the skills for this work. An apprenticeship program could allow Vermont to simultaneously empower rural and low-income communities while taking major steps towards its emissions reduction goals.

Such a program could prove especially beneficial in low-income and rural communities as it creates green jobs, and subsequently allows for the weatherization of more homes in disadvantaged communities. Vermont has one of the strongest weatherization programs in the country, ranking 8th in homes weatherized per capita in the nation.[167] Accessible opportunities already exist for low-income residences to receive subsidies for energy audits and weatherization services.[168] The Vermont Climate Action Plan's proposed weatherization workforce expansion strategy could be focused within the context of low-income and rural communities. Members of these communities could be prioritized as recipients of weatherization services and as weatherization service hires, promoting equity across two dimensions of the state weatherization programs.

4 REDUCING EMISSIONS FROM AGRICULTURE

The Vermont Climate Action Plan provides a single, broad pathway for reducing agricultural emissions: "Maintain and expand Vermont's natural and working lands' role in the mitigation of climate change through human interventions to reduce the sources and enhance the sinks of greenhouse gases."[169] In layman's terms, the pathway aims to reduce greenhouse gas emissions and increase the amount of carbon stored in non-gaseous forms such as soil or vegetation. Within this pathway there are several specific actions outlined by the Climate Council that range from individual-level farm improvement programs to statewide wetland restoration. This report will examine two of the actions proposed by the plan: implementing "agronomic practices that reduce tillage and increase

vegetative cover"[170], and developing a feed management program to reduce greenhouse gas emissions from ruminant livestock.[171] Both actions will be compared to similar programs in Pennsylvania and New York. These actions were selected due to their potential for immediate climate benefits and relatively low barriers of entry to adopters, in keeping with this report's focus on lower income Vermont residents.

4.1 PROPOSAL: EXPAND EXISTING FARM IMPROVEMENT PROGRAMS

Vermont's current cover crop and conservation tillage practices are implemented by the Vermont Agency of Agriculture, Food and Markets' (VAAMF) Farm Agronomics Practices (FAP) program, which falls under the umbrella of the agency's Best Management Practices (BMP) programs. The FAP program offers grants of $30-$40 per acre per farm, up to a maximum of $8,000, to "help Vermont farms implement soil-based agronomic practices that improve soil quality, increase crop production, and reduce erosion and agricultural waste discharges".[172] The FAP program is already quite successful, and overall, there are far more applicants for VAAMF farm improvement programs than there are grants awarded (see Figure 4.1.1).

Figure 4.1.1: Demand for VAAFM Programs that Help Farmers Improve Water Quality[173]

Aan increasing number of Vermont farmers are adopting BMPs, both with and without grant funding. According to a VAAMF report from 2019, roughly one-third of all annually tilled Vermont farms were seeded with cover crops, and conservation tillage is on the rise as well (see Figure 4.1.2).

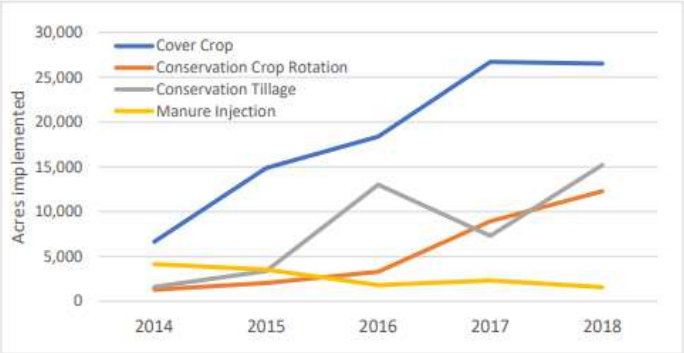

Figure 4.1.2: Trends in Farmer Implementation of Agronomic Practices[174]

The 2021 Climate Action Plan found that these programs were effective in their stated goals of improving soil and water quality, however they do not currently track GHG mitigation effects. That said, through studies conducted in Canada we know that programs like these are effective at reducing GHG emissions.[175] Thus, the programs could be expanded and a more robust method of quantifying GHG mitigation could be developed.[176] To put Vermont's current efforts in this area into perspective, Pennsylvania's Resource Enhancement and Protection Program (REAP) makes for a good comparison as it provides well-documented data and implementation practices for similar programs.

4.1.1 CASE STUDY: PENNSYLVANIA'S REAP PROGRAM

Pennsylvania's REAP is like Vermont's FAP in that it provides financial assistance to Pennsylvania farmers who implement agricultural BMPs. Though the program is designed to improve Chesapeake Bay water quality, many of the programs sponsored also reduce GHG emissions. The program covers "50%-75% of out-of-pocket project costs in the form of state tax credits - up to 250,000 dollars in any seven-year period, per agricultural operation"[177] for the following expenses:

- Project management costs, including design, engineering and associated planning
- Project construction or installation – including labor provided by the applicant
- Equipment, materials and other components of eligible projects
- Post construction inspections
- Interest payments on loans for project implementation for up to one year

Tax credits arising from REAP can be sold or traded to anyone looking to reduce their tax burden for a fifteen-year period, starting one year after the credit was awarded.[178] Credits are awarded upon completion of a project, with applicants covering the up-front costs. In fiscal year 2019 REAP funded 347 projects, and the number of program applicants far exceeded the number of credits awarded.[179]

In relative terms, Vermont's program appears to be outperforming Pennsylvania's REAP. In fiscal year 2019 VAAMF water quality improvement programs (including FAP) funded 85 projects.[180] To put these numbers into perspective, Pennsylvania funded projects on zero-point seven percent of its 52,700 farms,[181] while Vermont funded projects on roughly one and a quarter percent of its 6,800 farms[182] in 2019. Despite this apparent advantage, the Pennsylvania program's greater funding cap and broader support for continued inspections allows its farmers to undertake larger, more impactful projects.

While Pennsylvania's tax credit-based model is interesting and does offer some advantages in the realm of private investment, it would likely be more efficient for Vermont to expand existing programs and increase their funding. This is especially true when considering the equity concerns of tax credit programs when compared to grants. A 2019 study determined that, in general, tax credits favor pre-established businesses and other large entities, putting smaller organizations at a disadvantage.[183] Thus, with the Climate Council's focus on equity, a grant-based system is more in line with the state's goals. The key takeaway from this comparison is that Vermont's efforts to fund GHG emissions reductions programs on farms are already relatively strong and reach proportionally more farms than sister programs. Despite this relative success, funding only 85 farms per year will not be sufficient to meet emissions reductions goals. Increasing funding for agricultural improvement programs would allow FAP to fund more farms and, like Pennsylvania, greatly raise the maximum grant reward to help farms undertake larger, more ambitious projects. Finally, the Climate Action Plan's proposal to expand the Capital Equipment Assistance Program (CEAP), another grant-based improvement program, to cover all forms of climate change mitigation rather than just water quality improvements[184] should help Vermont close the funding gap between it and larger states.

4.2 PROPOSAL: REDUCE ENTERIC FERMENTATION

Twenty-five percent of Vermont's agricultural greenhouse gas emissions are due to manure management practices, totaling 0.35 million metric tons of CO_2 equivalent as of 2017.[185] Reducing this source of emissions would go a long way towards helping Vermont's agricultural sector meet its 2025 emissions targets. The Climate Action Plan recommends "research[ing] and develop[ing] a climate feed management program"[186] with the goal of reducing enteric fermentation, or greenhouse gasses emitted by ruminant livestock. A pilot program in New York provides a good example of effective mitigation.

4.2.1 CASE STUDY: NEW YORK'S PRECISION FEED MANAGEMENT PLAN

The New York Watershed Agricultural Council's Precision Feed Management Plan (PFM) is a small-scale pilot program developed to reduce the amount of phosphorus and nitrogen present in manure. In 2020 the program worked with forty-three dairy farms, totaling 2746 cows, and succeeded in reducing manure phosphorus content by 20 to 30%, while nitrogen reduction was not reported.[187] PFM farms also saw an increase in milk income over purchased cost of 157 dollars per cow per year,[188] which could be a strong selling point for potential adopters if a similar program were to be implemented in Vermont.

New York's PFM program provides planning, technical, and monitoring assistance to its participating farms with the goals of reducing overfeeding, increasing the percent of feed nutrients that come from the farm itself ("homegrown nutrients"), and documenting animal nutrient intake and production efficiency.[189] This involves visits from program staff to each participating farm, where they gather data on the cattle, their feed, and their excrement so that data trends could be observed and opportunities for improvement identified. The pilot program was staffed by five PFM planners, leading to a 1:12 ratio of staff to farms in 2020.[190] Assuming the same ratio, full-scaled implementation of a similar program on Vermont's 636 dairy farms[191] would require fifty-three planners. Given that the program relies on consistent monitoring, a more relaxed inspection schedule would likely be detrimental to

program goals. If Vermont were to implement a similar program, it could increase the number of farms that a single planner is responsible for, limit yearly enrollment, or stagger program adoption while slowly increasing the ratio or number of staff as both farmers and planners gain experience. Although the Climate Action Plan suggests further research into methane-reducing feed supplements such as seaweed, it recognizes that supplements tend to be expensive and very difficult to source locally.[192] Thus, for lower-income farms, the PFM program's lower barriers to entry and potential to increase profits is preferable. New York's PFM program demonstrates that reducing enteric emissions can be effective, equitable, and beneficial to farmers who implement it, providing inspiration for development of a similar program in Vermont.

5 EFFECTIVELY COMMUNICATING CLIMATE POLICY

This report, as mentioned earlier, focuses primarily on non-regulatory policies and voluntary participation in incentive-based GHG reduction programs. Thus, as with any incentive program, Vermont must be able to effectively advertise these programs to the public. Given the importance of climate equity, low-income and rural Vermonters are a critical audience and Vermont might benefit from steps to ensure that it communicates its policies in ways that appeal to these vulnerable populations.

5.1 LOW INCOME COMMUNITIES

A key factor that Vermont would likely benefit from considering in its messaging about the Climate Action Plan's programs is that, in general, low-income populations are more likely to respond if the subject seems personally relevant to them. A study conducted in 2019 found that "lower income was associated with higher perceived importance of improved emergency alerts, government-subsidized costs of household air conditioners and energy-efficient appliances, strengthening buildings against extreme weather, regulation of greenhouse gas emissions, urban planning using 'cooling' technologies, and expanding community gardens/local agriculture."[193] All of these "topics of perceived importance" can be tied to personal risks. For example, the desire for affordable air conditioning arises from dangerously hot conditions, while the desire for weatherization programs arises from the danger of property destruction due to extreme weather.

One of the best strategies that Vermont can use to communicate its new climate policy is to frame the issue as a personal health or finance problem, highlighting the benefits that its residents would gain by participating in the programs outlined by the Climate Action Plan. This sort of frame is appealing for several reasons. The first is that it can help sidestep the political nature of climate policy. Since people with different political orientations care about their personal well-being, presenting these programs as personally beneficial may yield better results than simply selling them as "good for the planet".[194] When encouraging farmers to apply for Farm Agronomics Practices grants to help them seed cover crops, for example, policymakers should see increased uptake if they highlight the fact that doing so will make their fields more resilient against flooding and drought rather than the amount of CO_2 it will prevent from escaping into the atmosphere. For programs that have the potential to increase air quality, such as the heat pump incentive program discussed earlier,[195] policymakers could highlight the health benefits of cleaner air such as reducing rates of asthma in children.[196] This would benefit the state's economy as well- a recent analysis by the American Lung Association found that,

by 2050, a cleaner transportation system could net Vermont over $73 million in value from avoided premature deaths, asthma attacks and work days lost.[197]

In conclusion, Vermont should consider focusing its environmental policy messaging towards its low-income residents on the personal financial and health benefits that state-sponsored programs can bring to those who adopt them. Additionally, Americans generally respond better to messaging highlighting personal risk,[198] so highlighting the imminent and personal dangers of climate change such as increased flooding or health hazards might increase policy adoption across all Vermont residents. As a national leader in the field of climate change mitigation, Vermont can set an example of strong policy communication, and doing so will be essential to the success of the mitigation programs outlined by the Climate Action Plan.

5.2 RURAL COMMUNITIES

Political division remains an obstacle in garnering rural support for climate policy. According to a nationwide study, divergence in urban and rural perspectives on climate policy was not a function of care for the environment or a lack of knowledge about environmental trade-offs; instead, it was due to different levels of civic distrust of the government.[199] Rural voters showed the most hesitancy toward federal policies and more skepticism about state policy than their urban counterparts. Rural reluctance to believe and act on the science behind climate change was found to be largely linked to negative experiences with or perceptions of negative impacts of existing environmental laws and regulations. However, rural voters were found to value environmental protection almost equally with urban and suburban populations, and they expressed personal investment in the fate of the environment. Rural voters indicated a strong sense of community, environmental stewardship, connection to nature, and moral obligation to future generations as their main motivations behind environmental protection.

In Vermont as elsewhere, rural citizens generally hold different policy opinions than their urban counterparts, but still value the environment and are not completely opposed to state environmental regulation. Based on the Yale Program on Climate Communication's data, a comparison of Chittenden, Franklin, and Essex Counties provides helpful insight into Vermonters' attitude towards climate change and potential factors that contribute to disparities among counties' answers, such as degree of rurality (measured by population density) and wealth. Chittenden County is the most densely populated county and has the highest median household income ($76,316) in the state. In contrast, Essex County is the least densely populated county and has the lowest median household income in the state ($47,035).[200] Franklin County is roughly in the middle of these two counties, with a population of about 55,000 (compared to the state county average of 46,225) and a median household income of $65,314 (compared to county median household income of $62, 120).

Residents of mostly urban Chittenden County expressed the highest degree of belief in climate change, as well as the highest level of engagement and participation in the climate change dialogue through personal conversation and media engagement. This finding is particularly interesting considering those in the more rural counties of Franklin and Essex have a heightened vulnerability to climate change. This could indicate a differential awareness of the wide-ranging effects of climate change, suggesting the opportunity for increased education on climate change and increased engagement in policy formulation and implementation in rural areas. Chittenden County also expressed more support for environmental regulation at all levels of governmental than either Essex or Franklin County, from the

presidency down to the locality, indicating a possible correspondence between general attitude toward governmental reach in environmental regulation and degree of rurality and/or median income.
But despite differences in desired levels of governmental regulation, there are high rates of support for CO_2 regulation and tax rebates for switches to more fuel-efficient technology in all counties, suggesting that such state government programs could find support in rural communities with proper messaging and implementation.

The heightened participation of rural stakeholders in state climate policy formulation could significantly help Vermont reach its emission goals. Collaboration with scientists, farmers, and rural stakeholders to develop climate education and communication strategies could prove beneficial in achieving policy goals while simultaneously improving rural communities. Accessible opportunities for rural voters to participate in climate policy dialogue allows for the incorporation of local knowledge into environmental policy and fosters a sense of empathy and listening between rural communities and the state government. Heightened engagement will not only promote equitable policy but further advance Vermont in its emission reduction goals.

Environmental policy messaging for rural communities could seek to appeal to community and stewardship values that emphasize rural Vermonters as an integral part of the solution. The messengers of policy to rural communities matter, as well. The state government could seek to work with local farmers and ranchers, cooperative extensions, and even industry representatives in local areas to disseminate information and gather feedback on climate policy.[201] Establishing bridges between rural citizens and the state government seems fundamental in achieving Vermont's climate goals. Vermont could set a new precedent in reaching rural populations for policy solutions, with equity and collaboration at the root of its climate policy. The following case study exemplifies how states can integrate rural citizens into climate policy conversation.

5.2.1 CASE STUDY: MINNESOTA RURAL CLIMATE DIALOGUES

In Minnesota, the Institute for Agriculture and Trade Policy and the Jefferson Center (now Center for New Democratic Processes) hosted the Rural Climate Dialogues (RCD) program in five counties, which "emphasize[d] listening and empathy-building; focus[ed] on each community's distinct hopes, challenges and sense of place; and ultimately create[d] locally-driven climate action plans".[202] In addition to creating a sense of empathy and listening on behalf of policymakers to rural communities, RCDs were intended to "filter rural perspectives up into state and federal climate policy".[203] The program had a pivotal pre-organization phase to determine key issues in communities through discussion with local elected officials, business leaders, teachers, and media outlets. RCDs gathered small groups (15-21 people) of demographically diverse people within a community and worked together to solve the indicated environmental-related communal issues for two to three days. Past topics include community resilience in the face of extreme weather and clean energy development. Participants went through an application process and received a stipend; transportation costs and childcare were provided, as well, to maintain accessibility. The sessions were completely participant-driven, and solutions are derived collaboratively at the community level. At the culmination of the project, participants presented their work to state agencies and their community. Some of these final projects included a State Navigator, an aggregation of all the state programs available to rural citizens to receive financial and environmental assistance; presentations to state and local agencies outlining

their findings; climate resilience education and implementation activities within the county; and "Statement for Our Neighbors", calls to action written by participants for their own county.

In post-program evaluation, participants noted how much they had learned about climate change, with some having entered the program skeptical of the threat of climate change. Participants also reported learning ways in which it affected them that they were not aware of beforehand. In post-evaluation surveys, the rate of being "very sure" or "extremely sure" climate change was happening rose from 55 percent to 83 percent after one county's RCD program.[204]

The implementation of a similar program in Vermont could better engage rural Vermonters in climate policy dialogue and actively build trust between the state government and rural communities. Potential RCDs in Vermont could not only help communities rally around the issue of climate change but also present the state government with feedback and ideas about how to address issues facing rural communities. Funding for RCDs was provided by Minnesota-based family foundations. A potential collaboration between Vermont family foundations and the state government might make the execution of RCDs in Vermont financially feasible.[205]. RCDs offer an engaging and meaningful way for the state government to communicate the reality of climate change and available state resources for low-income rural Vermonters, including weatherization services. Overall, RCDs could be a tool for equitable climate policy formulation and implementation and could help Vermont reach its emission goals.

6 CONCLUSIONS: SUMMARY OF FINDINGS

Rural and low-income Vermonters seem to hold the key to the state reaching its emission reduction goals. The Vermont Climate Action Plan delineates pathways to reduce emissions in the transportation, residential fuel, and agricultural sectors. Many of these pathways could be effectively pursued with intentional communication and public awareness strategies. In the transportation sector, the state could increase electric vehicle usage through the promotion of existing subsidies and online resources that highlight the benefits of electric vehicles and their accessibility. Similarly, promotion of alternatives to driving alone, including public transportation and carpooling, could significantly reduce vehicle miles traveled in the state. In the residential fuel use sector, increasing weatherization employment by means of an apprenticeship program could create green jobs for rural communities while simultaneously increasing the proportion of homes weatherized. Lastly, in the agricultural sector, increasing subsidies for existing soil and water improvement programs and implementing an economically beneficial feed management program could reduce emissions while directly benefiting farmers.

In all sectors, a general focus on the engagement of rural and low-income residents in the climate policy making process would likely garner more support for state policies as well as inspire communities to take local action in reducing emissions. The main takeaways of the report are outlined below in-detail.

Pathway-Specific Recommendations

- Transportation:
    - Light Duty Electrification

        - Assure Vermonters of electric vehicle price benefits by increasing subsidies to lower upfront costs or partnering with utilities/rural electric cooperatives to communicate lifetime benefits.
        - Assuage EV performance concerns through promoting online resources such as charging maps or implementing extended vehicle test-drive programs.
        - Change perceptions of electric vehicles by working with manufacturers and dealers to increase EV advertising, promote the capabilities and performance of sturdier models such as 4-wheel drive cars and pickup trucks, and increase community penetration of EVs.
    - Reduction in Vehicle Miles Traveled
        - Increase public transportation ridership by promoting first mile/last mile service integration, improving transit frequency and flexibility (including demand-response services where appropriate), and organizing an outreach campaign to highlight the ease and accessibility of public transportation to Vermonters.
        - Promote shared mobility options such as carpooling, car sharing, and ride hailing services.
        - Advertise alternatives to driving such as active mobility and teleworking by designing public streets to better meet the needs of bikers and pedestrians, improving high-speed broadband access, and revitalizing Vermont's historic downtowns.
- Residential Fuel Use
    - Consider using an apprenticeship program to expand the state's weatherization workforce and consequently homes weatherized
    - Consider tapping low-income and rural communities as a source for weatherization employees
    - Make opportunities for weatherization training more accessible and equitable
- Agriculture
    - Expand existing grant-based soil and water quality improvement programs to cover general GHG mitigation.
    - Implement voluntary-participation programs that bring economic benefits to adopters in addition to GHG reductions.
    - Use existing infrastructure whenever possible.

General Communication Recommendations

- Low-Income: Frame communication in a way that focuses on aspects that are personally relevant to low-income Vermonters such as the health benefits of GHG reduction, the economic benefits of weatherization programs, or the potential to avoid increases in flooding that result from climate change.
- Rural: Actively engage rural citizens in the policymaking process and focus on those issues that communities themselves identify and prioritize. Use messaging as an opportunity to educate rural communities on their unique vulnerabilities to climate change, and appeal to a sense of community and stewardship in environmental messaging.

The Vermont Climate Action Plan prioritizes equity in its emission reduction strategies. In order to meet the 2025 emission reduction goal, the state's current and planned programs will require significant increases in funding and participation to maximize their effectiveness.[206] Though the details of funding such programs are beyond the scope of this report, it has shown how the utilization of

existing programs and infrastructure combined with effective integration of and communication with Vermont's low-income and rural populations could prove impactful in reaching the state's emission goals. Vermont is already a national leader in climate change mitigation strategies. The state could also provide leadership as a climate equity trailblazer by appropriately addressing the needs of its most vulnerable populations through effective policy and tailored communication strategies.

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