

Inventory of Existing Programs that Impact GHG Emissions

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Agency of Transportation

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Outline

- Introduction
- Definitions
- Overview of State of Vermont GHG mitigation programs
- Review of sequestration
- Conclusions

Introduction

- §591(b)(1)(A) of Act 153 (2020)- “The Council shall:...creating an inventory of all existing programs that impact greenhouse gas emissions and their efficacy”
- This presentation provides an overview of existing state programs that reduce emissions of GHGs that are quantified in the emissions inventory

Introduction

- GHG Mitigation Projects Across State Government
 - Department of Buildings and General Services
 - Agency of Agriculture, Food & Markets
 - Agency of Commerce and Community Development
 - Agency of Natural Resources
 - Agency of Transportation
 - Public Service Department
 - Public Utility Commission
- Mitigation activities include a combination of programs that were specifically designed to:
 - Reduce greenhouse gases
 - Address other state priorities, with the co-benefit of GHG emissions reductions
 - May be additional opportunities to optimize programs for GHG emission reductions

Goals

- Review existing state actions to reduce GHG emissions
- Highlight sectors for further GHG emission reductions
- Discuss challenges associated with estimating GHG emission reductions

Definitions

- Mitigation (Merriam-Webster Dictionary)
 - The process or result of making something less severe, dangerous, painful, harsh, or damaging
- Climate change Mitigation (IPCC)
 - Mitigation: A human intervention that either reduces greenhouse gas emissions or enhances the storage of greenhouse gases
 - Mitigation Measures: Technologies, processes or practices that contribute to mitigation

Terminology

- Vermont GHG Emissions Inventory and GHG mitigation
 - Quantifies gross emissions (except biogenic CO₂)
 - Focus on emission reductions
 - Sequestration estimated, but not currently part of assessing progress towards goals
 - Currently tracks progress toward GHG emission reduction goals
- Renewable Energy Standard
 - Tier 1 – 75% Renewable by 2032 – any resource in New England
 - Tier 2 – As part of Tier 1, 10% Renewable Generation in Vermont < 5MW
 - Tier 3 – "Energy Transformation", fossil fuel reductions required (e.g., heat pumps, electric vehicles)
- GHG emission reduction measures
 - Programs and measures to reduce emissions are important
 - The impact of individual mitigation options or actions often can't be separated out in the GHG Emissions Inventory
 - **Primary Programs:** Measures with quantifiable GHG emission reductions
 - **Supporting Programs:** Programs or options that support the primary GHG mitigation measure

Example: Electrify the Fleet

- Several specific actions support this work
 - Primary: Regulatory requirements
 - Supporting: purchase incentive programs, installation of electric vehicle charging stations
- The Vermont GHG Emissions Inventory quantifies overall emissions for the entire transportation sector
 - Specific mitigation options are difficult to identify specifically in the Vermont GHG Emissions Inventory, but emission reductions are included in the total for the sector

Some Additional Important Considerations

- Equity
- Quantification of GHG reductions
- Cost effectiveness of reductions (\$/ton reduced)
- Externalities/Social cost of carbon
- Public health benefits/impacts
- Co-benefits of mitigation actions
- Impacts of mitigation actions on other State priorities (e.g., air pollutant emissions, agricultural lands)
- Effectiveness of mitigation actions (potential tons reduced)
- Regional and/or State mitigation measures

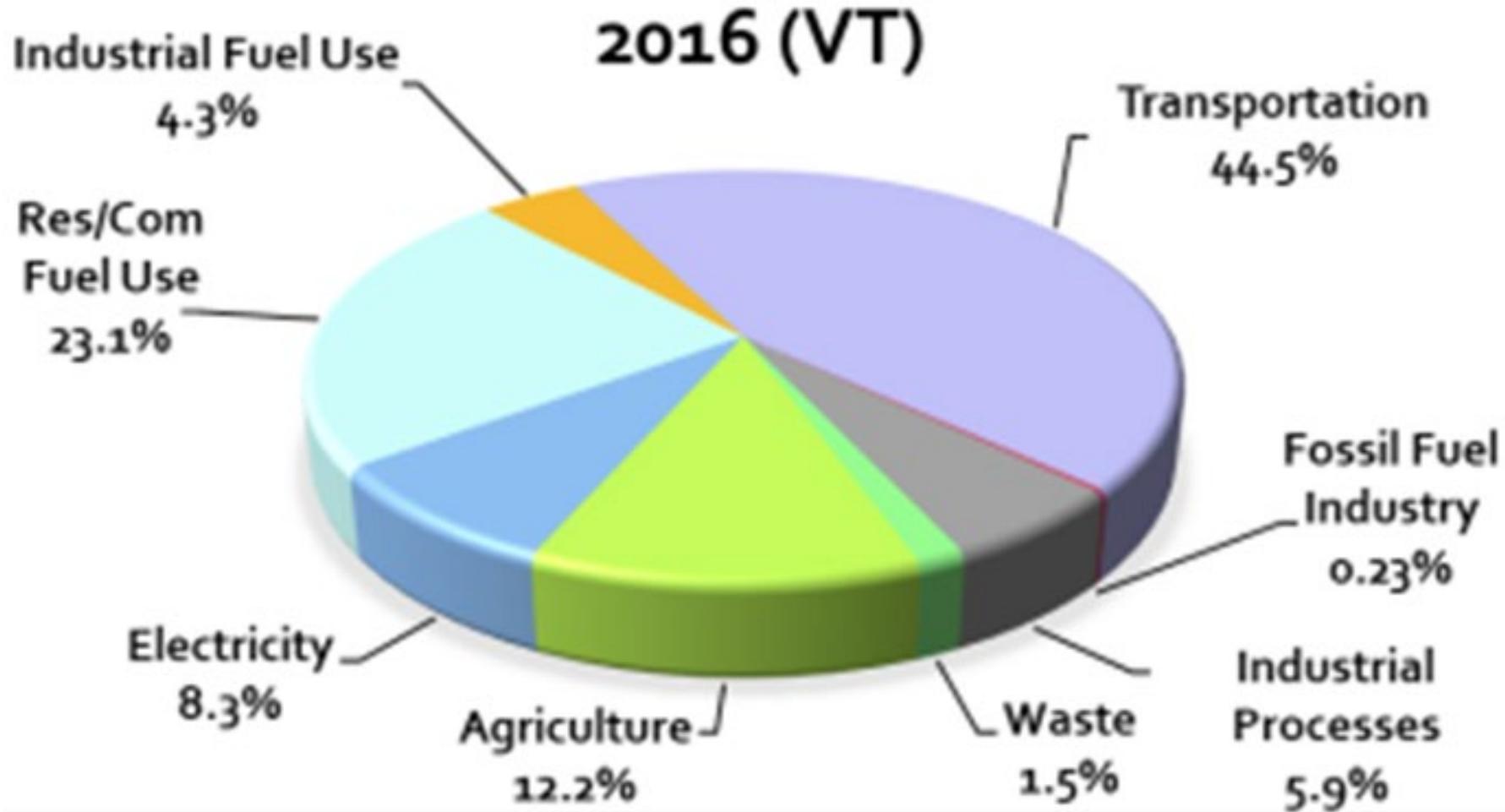
Current State-led GHG Mitigation Projects

- GHG mitigation work component of air quality, water quality, transportation, energy, land use, public health and fleet management work
- GHG mitigation work conducted across State Government

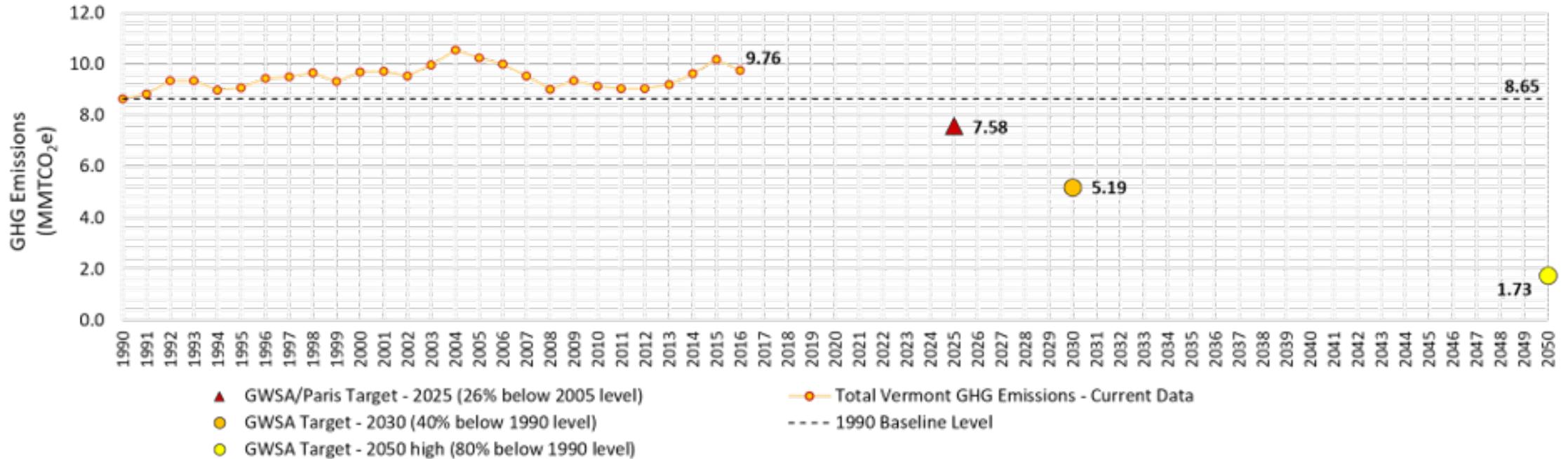
Examples today from:

- Agency of Agriculture, Food & Markets
- Agency of Human Services
- Agency of Natural Resources
- Agency of Transportation
- Public Service Department

Vermont GHG Emissions Inventory Review



Vermont GHG Emissions and Goals

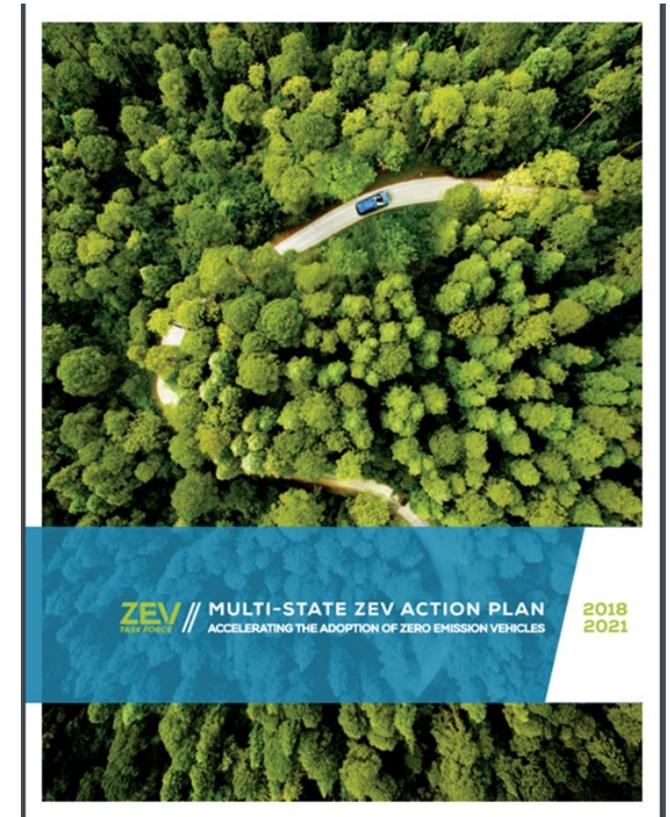
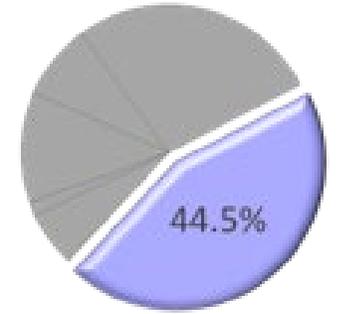


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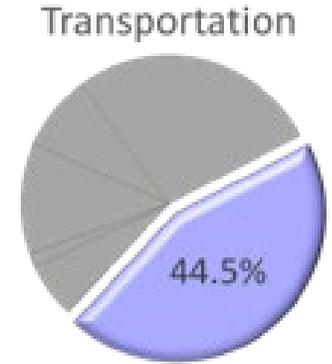
Vermont's Low Emission Vehicle (LEV) Program, including its Zero Emission Vehicles (ZEV) requirements

- New vehicles sold in VT meet CA emission standards
- **Primary**
 - Section 177, CA emission standards for criteria pollutants & GHGs
 - Manufacturer sales weighted fleet average for GHG and criteria pollutants
 - ZEV state requirements
- **Supporting**
 - Extended warranty coverage
 - Multi-state ZEV Task Force

Transportation



Transportation



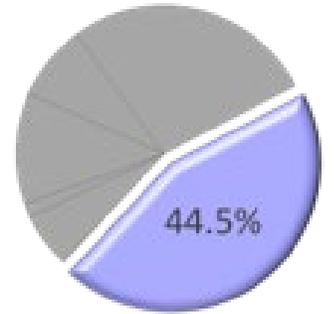
- Volkswagen Environmental Mitigation Funding
 - Intent to NOx emission reductions, State has focused on strategic electrification that have GHG reduction co-benefits
 - Eligible Projects
 - **Primary**
 - Diesel engine replacement projects
 - Electric bus pilot
 - **Supporting**
 - Electric Vehicle Supply Equipment (EVSE) Installation

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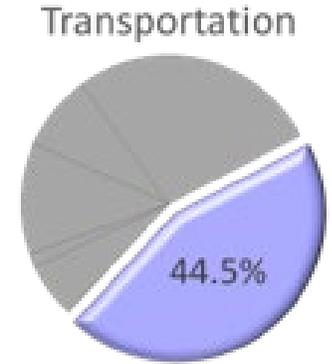
- EV Incentive Programs
 - Utility ("Tier 3") and VTrans, Federal tax credit
 - Focus on equity and additive behavior change
 - Federal Low or No-Emission (Low-No) funding
 - Purchase new electric buses

***Note:** For all incentive programs, the direct result is a change in equipment used, but the question is always whether an individual would have made the same choice absent the incentive. The evidence is always inconclusive, but incentives also play an important education, marketing, and trusted information source role for consumers.*

Transportation



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- **Supporting Programs**

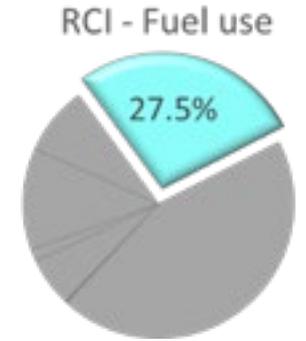
- ZEV MOU and Action Plan (DEC)
- Medium- and heavy-duty (MHD) ZEV MOU, Action Plan in development (DEC)
- EVSE installation grant programs
- Development of EVSE Weights and Measures
- EVSE signage policy
- VTrans Complete Streets, bike/ped and public transit programs
- Support for Drive Electric Vermont (DEV)
- Support for passenger and freight rail

Complexity Example: Public Transit

Public transit and GHG emission reductions

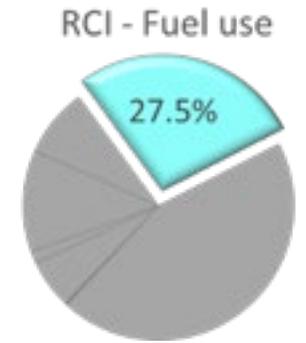
- Important component of long-term GHG reduction strategies
- Historically, in Vermont public transit approached as a public good/social benefit program, not designed for GHG emission reductions
- However, for public transit to reduce GHG emissions:
 - Increase ridership on existing routes (full buses/trains)
 - Maximize ridership on new routes (i.e., no empty buses)
- Because programs that create increased routes but maintain low ridership may not decrease GHG emissions until ridership increases
- More efficient buses result in net emissions reductions regardless of ridership

RCI Fuel Use



- Thermal Efficiency Program
 - Low-income Weatherization Assistance Program via Office of Economic Opportunity (AHS)
 - Efficiency Utilities:
 - Efficiency Vermont, Vermont Gas, Burlington Electric
- Renewable Energy Standard "Tier 3"
 - Programs to reduce fossil fuel use, including Heat Pumps
- Clean Energy Development Funding
 - Incentives for biomass heating

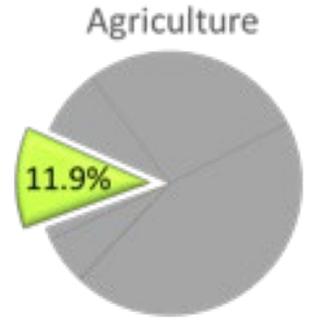
RCI Fuel Use



Supporting Programs

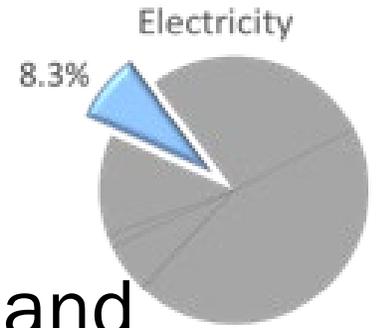
- Renewable Energy Standard
 - Tier 1 & 2 – Electric supply
- Building Energy Standards/Codes
- Large Customer Self-Managed Programs
- State Energy Management Program
- Above-ground storage tank rule
 - Leak detection

Agriculture



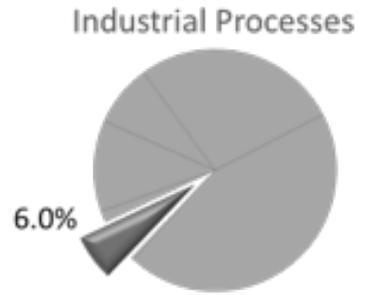
- Conservation practices
 - Cover cropping
 - Nutrient management
- Support for on-farm anaerobic digesters (AD)
- Supporting program
 - Farmland conservation practices (state, federal, and partners)

Electricity



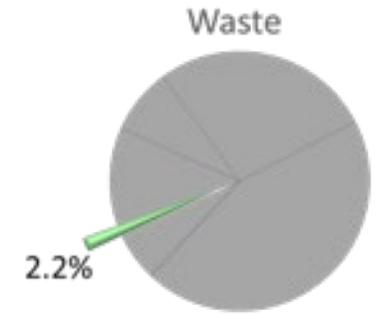
- Regional Greenhouse Gas Initiative (RGGI) - regional cap and invest program for electric generating units (EGUs)
- Electric Efficiency Utility (EEU) Programs
 - Performance targets include MWh, MW, GHG, flexible load capability
- Renewable Energy Standard Tier 1 & 2
- Supporting programs
 - Support for energy efficiency at wastewater treatment facilities
 - Incentives to support specific types of distributed generation, particularly on brownfields and landfills
 - Electric Rate Design (EVs, load management)

Industrial Processes



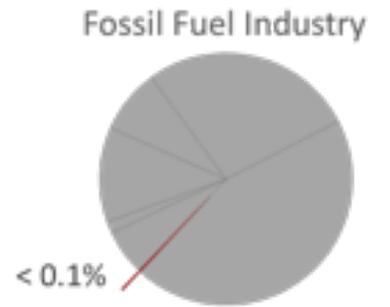
- Hydrofluorocarbon (HFC) Rule
 - Effective, December 2020
 - Pursuant to Act 65 (2019), ANR adopted rule to achieve GHG emission reductions through the phase-out of high global warming potential HFCs in air conditioning and refrigeration equipment, aerosol propellants, and foam end uses.

Waste



- Universal Recycling Law
 - Food-scrap organics ban
 - Programs to increase food diversion and reduce food waste
- Landfill gas to energy projects
- Anaerobic digesters at wastewater treatment plants

Fossil Fuel Industry



- Less than 0.1% of Vermont's estimated GHG emissions
- Efforts to test for and reduce leakage

Sector Recap

- Transportation emissions largest source of GHG emissions in Vermont
 - RCI and Agriculture also significant
- Programs to reduce emissions are a combination of emission reductions in each sector, with a focus on the largest sectors
- Challenging to separate one supporting program to reduce emissions within overall sector emissions

Sequestration: Forest Carbon

Increase carbon sequestration and storage in forests

- Tree planting: Urban and Community Forestry's Vermont Community Canopy and support given to tree plantings in municipalities
- Forest management techniques that increase carbon sequestration, harvesting durable wood products that store carbon for the life of the product and/or act as a substitute for higher energy products (fossil fuels, concrete, steel).

Avoid additional emissions from forests

- Program that aim to avoid deforestation and forestland conversion: Current Use program, Forest Legacy Program (federal), conservation easements
- Programs and policies that limit soil erosion: water quality programs and Acceptable Management Practices (AMPs) for logging operations

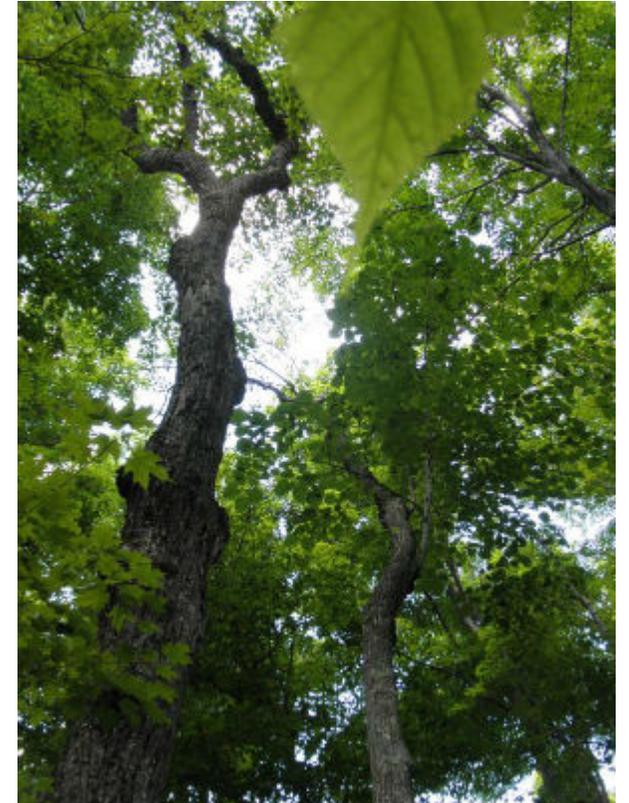


Image from Vermont Department of Forests, Parks and Recreation

Sequestration: Land Use

- Agriculture Conservation Practices
 - low/no-till practices
 - *Actively working to develop baseline data*

Takeaways

- State of Vermont has numerous programs that reduce GHG emissions directly and support GHG emissions reductions
- Additional work needed to quantify full impact of existing programs, ***but existing efforts will not enable state to reach Act 153 emission reduction requirements***
- Vermont GHG inventory quantifies anthropogenic emissions
- Additional work needed to fully quantify sequestration-based mitigation impacts

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Thank you

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References

IPCC, 2018: Annex I: Glossary [Matthews, J.B.R. (ed.)]. In: *Global Warming of 1.5 °C. An IPCC Special Report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press

Mitigation." *Merriam-Webster.com Dictionary*, Merriam-Webster, <https://www.merriam-webster.com/dictionary/mitigation>. Accessed 16 Dec. 2020.

Vermont Air Quality and Climate Division (2020) Vermont Greenhouse Gas Emissions Inventory and Forecast: Brief 1990-2016. <https://dec.vermont.gov/air-quality/climate-change>