

Executive Summary

Path to Zero Emissions

Creating a Sustainable Carlisle (First Report)



Prepared by:

The Carlisle Energy Task Force

Prepared for:

All who live or work in the Town of Carlisle, Massachusetts

Version 1.0

March 31, 2020

Executive Summary

The Carlisle Energy Task Force¹ prepared this report to:

- Help Carlisle residents understand the benefits and implications of adopting and pursuing goals to reduce Carlisle’s greenhouse gas emissions
- Help the Master Plan Steering Committee solicit input on the community’s level of support for adopting and pursuing emissions reduction goals.

The report documents Carlisle’s first community-wide estimate of greenhouse gas emissions (by sector and fuel type), identifies options for greenhouse gas reduction goals, and outlines a conceptual approach for reaching such goals.

2017 Emissions Summary

Figure ES-1 summarizes Carlisle’s 2017 direct greenhouse gas emissions.² In 2017:

- Residential emissions (including vehicles) accounted for about 88% of Carlisle’s direct emissions
- Transportation fuels accounted for about 43% of Carlisle’s overall direct emissions.

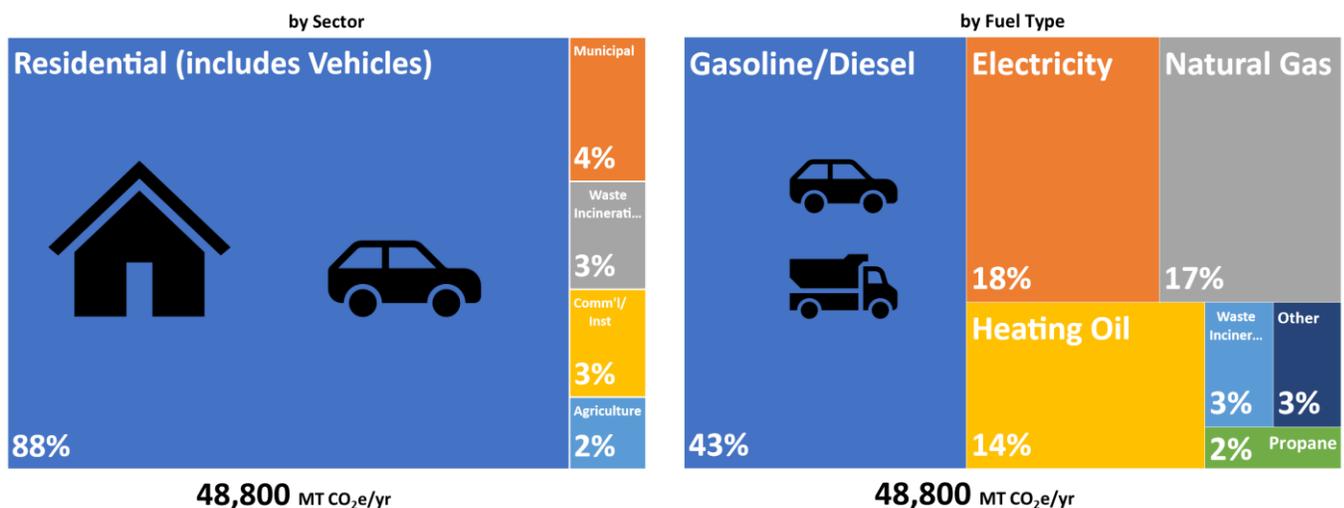


Figure ES-1: Summary of 2017 Greenhouse Gas Emissions for Carlisle

Compared to 1990, we estimate that, through 2017, Carlisle’s **residential energy use** has increased in proportion to population growth (20% population increase and 18% energy-use increase). During the same period, Carlisle’s **residential greenhouse-gas emissions** have not increased because the **emissions** associated with electricity generation in New England dropped significantly during this time period, translating to 57% lower **emissions** per unit of

¹ Prepared by the Sustainability Goals Subcommittee of the Carlisle Energy Task Force, consisting of Robert Zogg and Deborah Bentley, both Carlisle residents.

² Emissions are in units of metric tons of carbon-dioxide equivalent per year (MTCO₂e/year). A metric ton is about 2,200 pounds, or about 10% more than a U.S. ton.

electricity consumed. These trends do not account for the impacts of Carlisle’s switch in July 2018 to a Community Choice Power Supply Program—see discussion below.

Carlisle’s per-capita greenhouse gas emissions are over 40% higher than U.S. and Massachusetts averages. Compared to the average Massachusetts resident, the average Carlisle resident:

- Has a home that provides 45% more floor space *per occupant*
- Drives 40% more miles (19.0 vs. 26.5 miles/day/person)
- Has an annual income that is 115% higher.

These factors may in large part explain the higher emissions for Carlisle residents.

The emissions accounted for in Figure ES-1 above represent only about one third of Carlisle’s total emissions. Embedded emissions (i.e., emissions associated with the products and services we consume) primarily occur outside of Carlisle, and are difficult to estimate and track. Figure ES-2 shows one estimate of Carlisle’s total emissions.

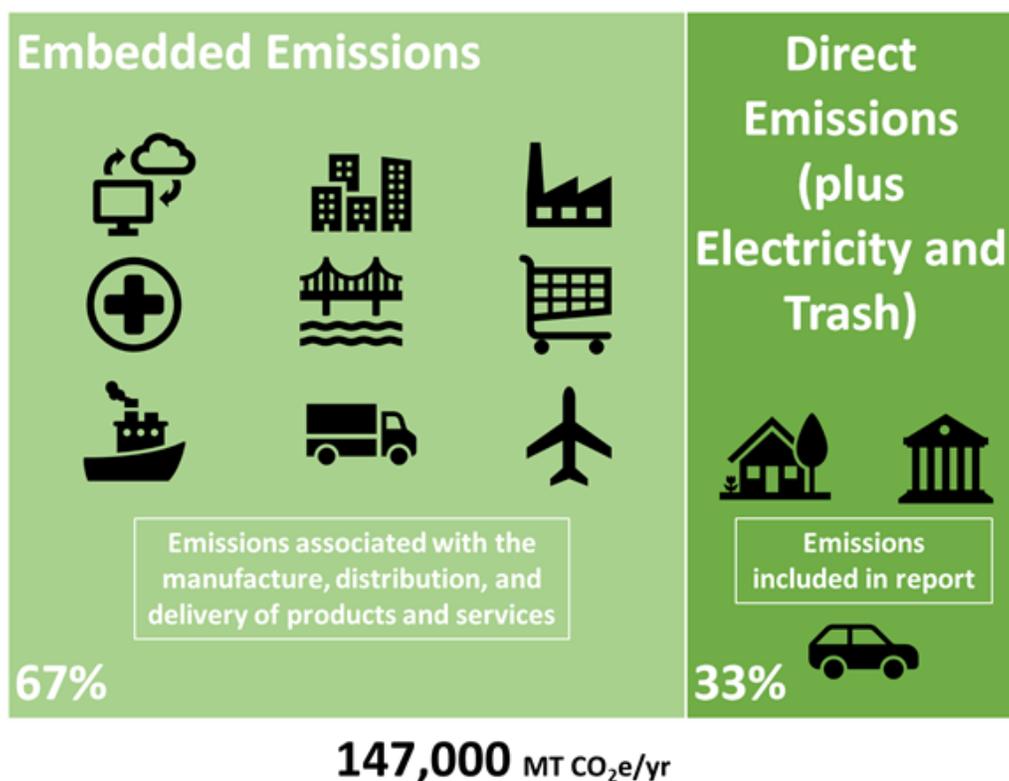


Figure ES-2: 2017 Carlisle Total (Direct and Embedded) Emissions

The impacts of accounting for forest/woodlands sequestration:

- Lower Carlisle total emissions by about 7% compared to a bare-ground alternative
- Increase Carlisle total emissions by about 3% compared to a fully forested alternative.

When comparing Carlisle's emissions to the Massachusetts average, accounting for forest/woodland sequestration has only modest impacts.

Carlisle's Progress to Date

Largely through volunteer efforts (primarily the Carlisle Energy Task Force and also the Carlisle Household Recycling Committee), Carlisle has taken several important steps to lower energy use and reduce greenhouse gas emissions, including:

MA Green Communities Program: From Fiscal 2009 through Fiscal 2019, Carlisle leveraged \$788,000 in state funding and utility incentives to lower municipal energy costs by an estimated \$120,000/year and municipal greenhouse gas emissions by 22%. As one of the requirements for this program, Carlisle adopted the Stretch Code (780 CMR 115.AA).



Solar Photovoltaics Programs: Through two solar programs, we increased Carlisle's solar generating capacity to about 1,000 kW (1 MW), producing an estimated 1,500 kWh/year, or about 6% of Carlisle's electricity use.



HeatSmart Program: Carlisle led this three-town initiative (with Concord and Lincoln) to promote installations of clean heating and cooling technologies. Under HeatSmart, Carlisle residents installed 11 air-source heat pumps and seven ground-source heat pumps.



Community Choice Power Supply Program: In July of 2018, Carlisle entered into a Community Choice Power Supply program that dramatically increased the amount of renewable electricity purchased in Carlisle. This step alone **cut Carlisle's electricity emissions by 77% and overall emissions by 14%**.



Community Composting: Carlisle's community composting program reduces our municipal solid waste and, in turn, reduces the Town's incineration fees, GHG emissions associated with waste incineration, and landfill requirements for incinerator ash.



Carlisle continues to work towards additional energy savings and emissions reductions through:

- **Green Communities:** Carlisle continues to participate in Massachusetts Green Communities program
- **Municipal Solar:** Carlisle is installing a solar canopy at the Carlisle Public School using a third-party owner/operator (see Figure ES-3). Not only will this installation provide renewable electricity, but it is also expected to provide \$676,000 in lease payments to the Town over the next 20 years.

- **Trash Reduction:** Carlisle is exploring additional options to lower municipal solid waste to reduce costs, greenhouse gas emissions associated with waste incineration, and landfill requirements for incinerator ash.
- **Carlisle's New Master Plan:** Carlisle has launched a master plan development process that will address environmental sustainability.



Figure ES-3: Solar Canopies at Carlisle Public School (Summer 2020 Projected Completion)

Options for Emissions-Reduction Goals

Should Carlisle choose to adopt goals to lower greenhouse gas emissions, we identified two logical options:

1. Align with the Massachusetts Global Warming Solutions Act of 2008 (GWSA): Lower town-wide greenhouse gas emissions by 80% by 2050 (1990 baseline) (5% average annual reduction)
2. Align with 2018 recommendations of the Intergovernmental Panel on Climate Change (IPCC): Lower town-wide greenhouse gas emissions by 95% by 2050 (2017 baseline) (10% average annual reduction).

The latter option better reflects what climate scientists estimate is needed globally to limit global warming to 1.5°C and thereby avoid some of the most serious consequences of global climate change. Further, Governor Baker pledged Massachusetts to a new goal of net zero carbon emissions by 2050 at his January 21, 2020 State of the Commonwealth Address.³ This may lead Massachusetts to update the original GWSA goals.

³ Transcript available at: <https://www.mass.gov/news/governor-baker-delivers-2020-state-of-the-commonwealth-address>

Recommended Conceptual Approach

While the GWSA establishes emissions-reduction goals for the state, effectively addressing emissions associated with individuals, small businesses, and municipal operations will likely require local actions and initiatives. Should Carlisle choose to adopt emissions-reduction goals, the most effective approach will likely include:

- Improving the energy efficiency of our homes and buildings
- Electrifying (i.e., converting from fossil fuels to electricity in homes / buildings / vehicles)
- Continuing to switch to renewable electricity
- Sequestering carbon and lowering agricultural emissions, where feasible
- Promoting more sustainable behaviors.

Improving energy efficiency is the most important step in the process of lowering emissions of our homes and buildings. Simply electrifying and using renewable electricity is not sufficient.

To successfully implement this approach, Carlisle will want to:

- Hire a Sustainability Director to manage and promote the process
- Develop energy plans for existing homes and buildings
- Promote electric vehicles
- Promote home/building weatherization, followed by installation of high-efficiency electric appliances and equipment (most importantly, for home/building heating/cooling and domestic water heating)
- Consider regulations and/or permit fees that:
 - Encourage or require new homes and buildings to:
 - Meet passive building standards, or be zero net energy or “zero energy ready”
 - Be electric-vehicle ready
 - Encourage modestly sized living units (using innovative designs to achieve excellent space utilization and aesthetic appeal)
 - Permit multi-family housing on a limited basis, including renovating single-family homes into two-family homes
 - Protect trees and other woody biomass
 - Discourage new uses of fossil fuels
- Establish and maintain accountability for municipal energy use and emissions, and incorporate environmental sustainability into municipal decision-making
- Evaluate and explore new options to purchase and generate renewable electricity
- Promote broad and meaningful community engagement in the process.

Key Benefits

Should the community decide to do so, adopting and pursuing greenhouse gas reduction goals will:

- Help Carlisle residents, businesses, institutions, and municipal departments lower energy costs and reduce environmental impacts
- Improve comfort of homes and buildings
- Improve resiliency to natural disasters of homes and buildings
- Leverage funds from grant programs and utility incentives
- Encourage other communities to pursue similar goals
- Help Massachusetts achieve its emissions reduction goals
- Improve air quality
- Leave a healthier planet for current and future generations.

Key Challenges

A meaningful initiative to pursue emissions reductions will present challenges, including:

- Securing taxpayer investment for a Sustainability Director to develop an implementation plan, pursue grant opportunities, support community initiatives, manage volunteer efforts, and educate the community
- Recruiting adequate community volunteers to assist the Sustainability Director
- Exploring policy changes (such as new bylaws and zoning ordinances) that may be unpopular among some stakeholders
- Motivating Carlisle residents, businesses, institutions, and municipal departments to adopt more sustainable practices.

Next Steps

The key next steps include:

- Broadly vet the idea of setting emissions goals (and the key benefits / implications) through the new master plan development process
- If warranted by the outcome of this vetting process:
 - Incorporate emissions goals into the new master plan, along with a summary of the conceptual approach
 - Present a warrant article at the Annual Town Meeting in 2021 to secure funding for a Sustainability Director
 - Hire a Sustainability Director
 - Develop and execute an implementation plan.