CARY®

EXECUTIVE SUMMARY

MUNICIPAL GREENHOUSE GAS INVENTORY AND PATHWAYS ANALYSIS

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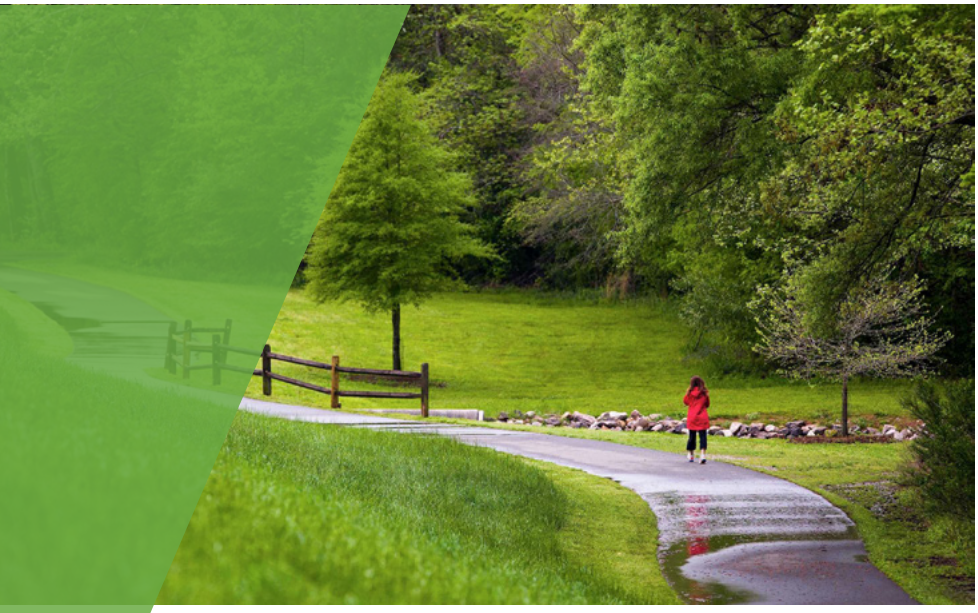


Introduction

Cary has demonstrated a longstanding commitment to sustainability and energy efficiency. In 2012, Cary created the *Strategic Energy Action Plan (SEAP)* to establish energy reduction goals and management plans for municipal operations, including water management, fleet, buildings, and streetlights.

While the SEAP focused on energy-related performance metrics, a growing recognition of climate change has driven a shift toward reducing greenhouse gas (GHG) emissions, the primary form of pollution causing climate change. The *Municipal GHG Inventory and Pathways Analysis* was created to measure, track, and ultimately reduce municipal GHG emissions from a 2022 baseline, while still prioritizing energy reduction and efficiency. There is a related effort within the *Sustainability and Climate Action Strategy* which outlines a community-wide approach to emissions reductions.

Municipal Pathways Analysis

Cary aims to achieve ambitious goals while operating in a challenging context. Like many neighboring communities, Cary is growing quickly, contributing to a continually changing operational carbon footprint. In addition, some aspects of Cary's carbon footprint, such as the sources of electricity supplied to the region, are beyond Cary's direct control. The *Municipal GHG Inventory and Pathways Analysis* is designed to chart a path forward through phased changes that will improve performance in the long-term.

In order to reduce GHG emissions from operations, Cary must do the following:

- Utilize facility upgrades, equipment replacements, and other approaches to improve efficiency and eliminate the use of fossil fuels.
- Maximize renewable energy production at all municipal facilities and drive investments in local renewable generation through purchasing.
- Transition to utilizing renewable fuels where necessary while strategically moving to a zero-emissions fleet.
- Eliminate sources of waste that cannot be recycled or composted from normal operations.

With a comprehensive array of strategies, Cary has mapped a pathway to reducing GHGs from operations 38% by 2030 and 86% by 2050. In the years ahead, Cary will continue to revise and update plans to take advantage of new technologies and accelerate this timeline wherever possible.

Integrating New Metrics

Staying on target will require tracking a new set of performance metrics and utilizing them to adjust tactics as needed. Cary's previous processes for tracking energy use and GHG emissions were primarily designed to manage finances around these systems. Moving forward, however, Cary is upgrading its management systems to better track energy use, reduce costs, and measure GHG emissions, including:

Tracking energy consumption and optimizing energy efficiency opportunities across all Cary-owned facilities.

Combining vehicle fleet operations with fuel consumption data to prioritize investments in clean vehicles and find other operational savings.

Measuring the health, diversity, and co-benefits of public trees to guide planting and management decisions.

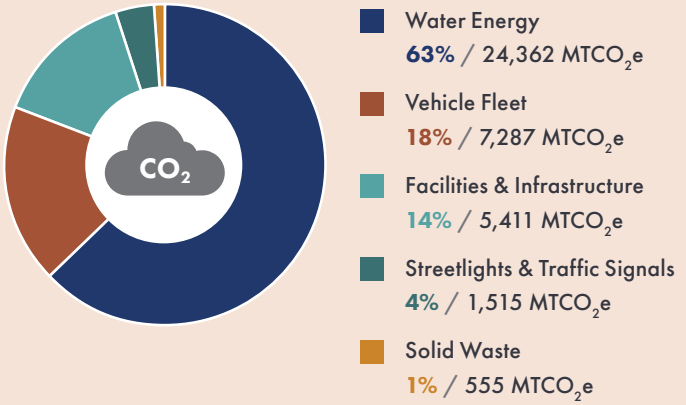
Tracking waste generation and diversion rates to identify policies for effectively reducing waste.

EXISTING CONDITIONS

Municipal GHG Inventory

In 2022, Cary's municipal operations generated 39,131 metric tons of carbon dioxide equivalent ($MTCO_2e$). Energy used to power water treatment and delivery systems accounted for the majority (63%) of municipal GHG emissions. The second largest source of GHG emissions was the facilities and infrastructure sector (14%) including emissions related to heating, cooling, lighting, and powering appliances in municipal buildings. The Cary-owned vehicle fleet accounted for 18% of municipal GHG emissions.

Figure 1. 2022 Municipal GHG Emissions



CHARTING THE FUTURE

GHG Reduction Pathways

The pathways analysis considers:

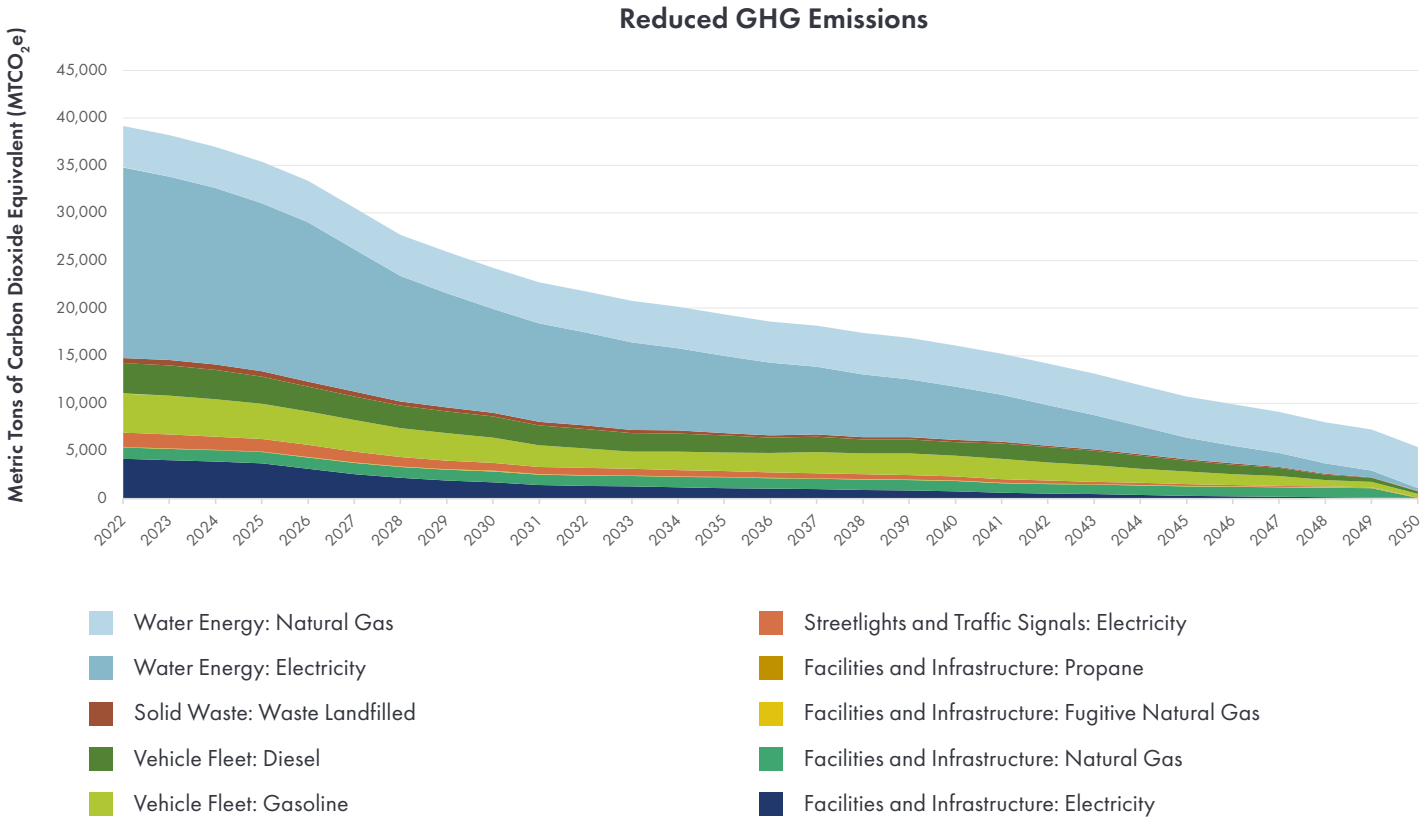
1. A "business as usual" (BAU) GHG emissions projection that illustrates the emissions trajectory if no action is taken.
2. An anticipated GHG reduction pathway resulting from policy changes and actions that reduce energy consumption and emissions from municipal operations.

The pathways analysis illustrates additional reductions to GHG emissions beyond expected BAU levels as a result of high-impact strategies, including the installation of rooftop solar projects on municipal properties, the implementation of high-efficiency retrofits in municipal buildings, and the transition to low-carbon fuels and electrification of municipal vehicles. With the impact of the currently quantified conservation measures applied, municipal GHG emissions are estimated to be reduced to 5,420 $MTCO_2e$ by 2050–an 86% reduction.

In 2050, the primary source of emissions that remains in this projection is the natural gas used in wastewater treatment processes, primarily to dry biosolids to reduce trucking costs and diesel use. Cary fully expects that the technologies needed to address this source of emissions will emerge in the coming years and future updates to this analysis should show a clear pathway to zero emissions by 2050.

Figure 2. Municipal Pathways 2022-2050

The chart below models the opportunity for GHG emissions reductions from municipal operations through 2050. The wedges illustrate the reductions in GHG emissions that can be realized in Cary over time as high-impact strategies and actions are implemented.



Priority Actions

Achieving the emissions reductions illustrated in the pathways analysis will take concerted effort across all municipal operations. The key actions Cary will need to undertake are outlined below. These actions are also included in Cary's *Sustainability and Climate Action Strategy*.

Fleet

- Create an alternative fuels vehicle strategy to transition Cary's fleet, prioritizing lowest carbon-intensity solutions available for each vehicle type.
- Use strategic planning and operational solutions to reduce municipal transportation miles driven.
- Develop a tool to evaluate EV charging demand on municipal property to ensure available infrastructure is meeting Cary's needs.

Municipal Facilities

- Identify opportunities to incorporate design principles from the Living Building Challenge into new municipal facilities and leased spaces.
- Prioritize all-electric specification for municipal equipment upgrades where current technology matches facility operational requirements.
- Utilize findings from the Solar Feasibility Study to prioritize and install solar on existing municipal facilities.

Natural Resources and Urban Forestry

- Quantify the climate benefits provided by existing public trees along streets, public buildings, and in parks.
- Establish standard operating procedures for the sustainable maintenance and management of Cary-owned open space.

Waste and Procurement

- End purchasing of single-use plastics and phase in zero-waste requirements into catering and food service offerings for municipal facilities.
- Develop sustainability criteria to be incorporated into Cary's Procurement Planning Program.
- Update standard operating procedures for recycling and composting at all municipal facilities.
- Conduct waste audits at Cary buildings occupied by 10 or more full-time staff.

Water and Wastewater

- Continuously evaluate opportunities for renewable energy deployment at water and wastewater facilities to meet electric loads as much as possible.
- Monitor for advances in industrial decarbonization that meet the energy demand of wastewater treatment facilities.

SEIZING THE MOMENT

Installing solar energy has high up-front costs, but numerous financing mechanisms exist. For new projects, up to 30% of the installation costs can be recouped through the Investment Tax Credit or a project can receive $0.0275 per kWh through the Production Tax Credit. Either way, the next few years are an opportunity for Cary to invest in and fully claim the benefits of solar from the beginning of a project.

Tracking Performance

In the years ahead, Cary will continue to track total GHG emissions from its operations and ensure a steady course to eliminating them. In addition, the following key performance metrics will be used to demonstrate progress.

SECTOR	METRIC	INFORMATION
BUILDINGS	Energy (MMBtu) per square foot	Sometimes called Energy Use Intensity (EUI), this metric controls for the size and different fuel types used across different buildings. By monitoring individual facilities and the portfolio as a whole, Cary will be able to continuously reprioritize around hot spots and keep a consistent target over the long term as facilities change over time.
ENERGY SUPPLY	Share of electricity that is generated on-site	Separated by facility, this metric can help to optimize operations around available renewable energy and will work well with potential energy storage applications.
FLEET	GHG emissions per mile traveled	Tracked at both the vehicle and fleet-wide level, this metric will help identify where fuel switching has the greatest potential for reduced GHG emissions and how changes to the carbon intensity of electricity are helping to meet Cary's goals.
NATURAL RESOURCES & URBAN FORESTRY	Tree Stocking Rate (%)	Tree stocking refers to planting trees in vacant public spaces (e.g., along roads and in parks). This metric will demonstrate how Cary is maximizing its urban forestry resources.
WASTE	Office waste disposed (lbs) per occupant	By focusing on waste disposed, this single metric will showcase the impact of waste avoided, composted, or recycled in a consistent way across all municipal facilities.
WATER AND WASTEWATER	Energy (MMBtu) per million gallon delivered/treated	This metric will show operational improvements even with year-to-year changes in the volume of water supplied.

Short-Term Strategies

Cary will proactively invest in buildings and new equipment where there is the greatest potential impact. In addition, there are operational savings that could be realized immediately by making changes to how office equipment and other appliances are used in buildings. Across Cary facilities, there is likely over 100 $MTCO_2e$ worth of annual GHG emissions reductions that could be achieved simply by operating more efficiently.

Long-Term Strategies

Energy used in the supply of water and wastewater treatment is the largest source of GHG emissions from Cary's operations. This source is also difficult to address due to the large amounts of energy required to successfully operate these systems. Industry innovations will continue to be evaluated and considered to improve efficiency and reduce GHG emissions. While this appears like a difficult problem today, there may be viable solutions available in a short amount of time. The same is true for heavy equipment and trucks.

While working towards long-term solutions, Cary will continue to re-evaluate options and weigh trade-offs to maximize impact. For example, Cary knows that moving to an electric fleet is needed to get to zero emissions, but there is an opportunity to have a greater impact by moving the fleet toward renewable propane in the short term while more renewable energy is added to the grid. Similarly, the energy spent on wastewater treatment to dry and condition biosolids for land application leads to better outcomes for GHG emissions reductions than would occur from trucking wet material or disposing of it in other ways.

This analysis illustrates how Cary can take action to effectively reduce municipal emissions over time. Now, Cary will work to seize the right opportunities to implement efficiencies and innovative technologies and programs to improve municipal operations and benefit the entire Cary community.

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On the path toward a climate-friendly future, Cary's efforts to reduce emissions can show what is possible and set a tone for continuous improvement across the entire community. That commitment will pave the way for every citizen and business to play a role in the success of Cary's *Sustainability and Climate Action Strategy.*